DOCUMENT RESUME

ED 345 770 JC 920 246

TITLE	Science and Technology Education in Two-Year Colleges. Hearing before the Subcommittee on Science of the Committee on Science, Space, and Technology. U.S. House of Representatives, One Hundred Second Congress, First Session (November 19, 1991). No. 92.
INSTITUTION	Congress of the U.S., Washington, DC. House Committee on Science, Space and Technology.
REPORT NO	ISBN-0-16-038389-7
PUB DATE	92
NOTE	293p.; Some pages may be marginally legible due to small size and lightness of print.
AVAILABLE FROM	U.S. Government Printing Office, Superintendent of Documents, Congressional Sales Office, Washington, DC 20402.
PUB TYPE	Legal/Legislative/Regulatory Materials (090)
EDRS PRICE	MF01/PC12 Plus Postage.
DESCRIPTORS	Community Colleges; Educational Finance; *Educational Improvement; *Educational Legislation; Federal Aid; *Federal Legislation; Government School Relationship; Hearings; Legislators; *Science and Society; *Science Education; *Technical Education; Technological Advancement; Two Year Colleges
IDENTIFIERS	Congress 102nd; Proposed Legislation

ABSTRACT

This report on a House congressional hearing on proposed legislation regarding the improvement of science and technology education and advanced technical training in two-year colleges presents testimony, along with prepared letters, statements, and supplemental materials. The report opens with an introductory statement by Rick Boucher, the House subcommittee chair, and continues with testimony and prepared statements on the Technical Education and Training Act of 1991 (H.R. 2936) and the National Community College Technology Act (H.R. 3606). Statements and, in some cases, responses to questions by subcommittee members are provided by the following witnesses: Nebraska Congressman Peter Hoagland; Dr. Luther S. Williams, National Science Foundation; Jeff Ellison, Intel Corporation; P. Douglas Groseclose, Martin Marietta Electronics; Dr. Cary Israel, Illinois Community College Board; Dr. William F. Synder, Wytheville Community College (Virginia); and Dr. Paul C. Gianini, Jr., Valencia Community College (Florida). The report concludes with the subcommittee markup of H.R. 2936 and the full committee markup of H.R. 2936. An appendix provides statements submitted by Sam Villareal of the Texas Engineering Extension Service, Texas A&M University System, and V. David Vandelinde, the Chair of the Engineering Education Coalition, along with the subcommittee report on H.R. 2936. (JMC)

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SCIENCE AND TECHNOLOGY EDUCATION IN TWO-YEAR COLLEGES

HEARING

BEFORE THE

SUBCOMMITTEE ON SCIENCE

OF THE

COMMITTEE ON

SCIENCE, SPACE, AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED SECOND CONGRESS

FIRST SESSION

NOVEMBER 19, 1991

[No. 92]

Printed for the use of the
Committee on Science, Space, and Technology

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SCIENCE AND TECHNOLOGY EDUCATION IN TWO-YEAR COLLEGES

TUESDAY, NOVEMBER 19, 1991

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
SUBCOMMITTEE ON SCIENCE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:37 a.m. in room 2325, Rayburn House Office Building, Hon. Rick Boucher [chairman of the subcommittee] presiding.

Mr. BOUCHER. The subcommittee will come to order. This morning, the Subcommittee on Science will review proposed legislation directed toward the improvement of science and technology education and advanced technical training in two- year colleges.

Two-year colleges are a major contributor to higher education in the United States. In 1990, 1,300 two-year institutions enrolled approximately 5 million students. That number comprised 43 percent of all undergraduate students in the Nation. From the standpoint of science and technology education, two-year colleges are particularly important as a potential source of future scientists and engineers and as a major provider of vocational training.

While these institutions play an important role, they often face problems that impede their effectiveness. Some faculty at two-year institutions are not well trained for their tasks. Many labor under heavy teaching loads and work in an environment that often lacks scholarly tradition. Laboratory facilities and equipment are often outmoded and expensive to upgrade.

Our hearing today will focus on two items of legislation: H.R. 2936, the Technical Education and Training Act of 1991, sponsored by our colleague from North Carolina, Mr. Price, and H.R. 3606, the National Community College Technology Act, sponsored by our colleague from Nebraska, Mr. Hoagland. Both bills direct the National Science Foundation to administer grant programs to strengthen the instructional base in advanced technology at two-year colleges and to support a variety of partnership arrangements with secondary schools and with four-year institutions.

Our purpose today is to assess whether these bills address the most critical issues for improvement of advanced technical training at two-year colleges and whether the proposed programs are likely to achieve their goals. We are also interested in learning how the proposed programs relate to similar activities that are sponsored by other Federal agencies and by the private sector, and whether the

National Science Foundation is the proper agency to administer the grants that are recommended in the proposed bills.

We are very pleased to have with us this morning the authors of these two measures, Mr. Price and Mr. Hoagland, both of whom have been leaders in the national effort to ensure that the United States has a well-trained work force up to the task demands of the 21st Century.

Following their statements, we will also hear from a representative of the National Science Foundation. Finally, we will have a panel of representatives from two-year colleges and from industries that use two-year colleges for advanced technical training.

On behalf of the subcommittee, I want to extend a welcome to all of our witnesses this morning. Before turning to them, I would like to now recognize the gentleman from New Mexico, Mr. Schiff, for his opening statement.

[The prepared statement of Mr. Boucher follows:]

OPENING STATEMENT
BY
THE HONORABLE RICK BOUCHER, CHAIRMAN
SUBCOMMITTEE ON SCIENCE
ON
HEARING ON SCIENCE AND TECHNOLOGY EDUCATION IN TWO-YEAR COLLEGES

November 19, 1991

This morning the Subcommittee on Science will review proposed legislation directed toward the improvement of science and technology education in two-year colleges.

Two-year colleges are a major contributor to higher education in the United States. In 1990, 1300 two-year institutions enrolled approximately 5 million students, which comprised 43 percent of all undergraduate students.

From the standpoint of science and technology education, two-year colleges are particularly important as a potential source of future scientists and engineers and as a major provider of vocational training. Nationally, *about 30 percent of two-year college students transfer to four-year institutions, and industry spends more than $1 billion per year on training provided by two-year colleges.*

While two-year colleges play an important role in science and technology education, they face problems which impede their effectiveness. Some faculty are not well trained, have heavy teaching loads, and work in an environment that lacks scholarly tradition. Laboratory facilities and equipment are often outmoded and expensive to upgrade.

The hearing today will focus on H.R. 2936, the Technical Education and Training Act of 1991, and H.R. 3606, the National Community College Technology Act. Both bills direct the National Science Foundation to administer grant programs to strengthen the instructional base in advanced technologies at two-year colleges, and to support a variety of partnership arrangements with secondary schools and with four-year institutions.

Our purpose today is to assess whether or not these bills address the most critical issues for improvement of science and technology education at two-year colleges and whether the proposed programs are likely to achieve their goals. We are also interested in how the proposed programs relate to similar activities now sponsored by federal agencies or the private sector, and if NSF is the proper agency to administer the proposed programs.

We are very pleased to have the authors of the two bills, Rep. David Price of North Carolina and Rep. Peter Hoagland of Nebraska, with us this morning. Following their statements, we will hear from a representative of NSF. Finally, we will hear from a panel of representatives of two-year colleges and representatives of companies which use two-year colleges for high-technology training.

We welcome all of our witnesses and look forward to your testimony.

Mr. **Schiff**. Thank you, Mr. Chairman. I will be brief. I want to first thank you for holding this hearing and thank the witnesses for coming. You have pointed out the fact that is often lost sight of, that millions of American students are not in four-year universities. They are in other educational institutions, and it is important that the Congress pay attention as to the level of education—in this case, science and technology education—that is available in those institutions, and in particular, how we can assist.

I have to say, however, to the witnesses—past our colleagues who are waiting to testify because they know about what I am going to say—that this is an extremely busy time with a number of committees meeting simultaneously. My ranking member, Mr. Packard, is at a conference committee meeting, and I am going to be going to a Judiciary Committee meeting, and I assume that other Members may be in and out.

I want to stress to the witnesses that even though this is all happening in the midst of a number of other things, we are paying great attention to what you are going to tell us today. I have a staff member here in the room who will remain here during the entire proceedings and will let me know about the nature of the testimony. So I want to assure you that even though there are some comings and goings, we are very interested in what you are saying and we are not disregarding it.

Thank you, Mr. Chairman.

Mr. **Boucher**. The Chair thanks the gentleman and recognizes the gentleman from Oregon, Mr. Kopetski.

Mr. **Kopetski**. Thank you, Mr. Chairman. I join with my colleague from New Mexico in applauding you for this timely hearing. I, too, serve on the Judiciary Committee, and we have a markup this morning.

Mr. Chairman, Oregon has been in the forefront in its development of two-year community college schools. We have 16 different community college districts in our State.

As a result of changes in our financing structure to the negative, quite frankly, we are seeing for the first time this year, a dramatic shift in students away from the four-year institutions into the two-year colleges. That is because our State experienced a 30 percent tuition increase this fall in our four-year schools. This is driving a number of students to the two-year colleges.

These students will go on and complete their four-year degree, some of them in the sciences, so this hearing is very timely, not just for the State of Oregon, but I think for other States as well, as this local government financing phenomenon becomes a reality in most of the States. So I commend you and commend my two colleagues at the witness table for the foresight in the bills that they have introduced.

Mr. **Boucher**. The gentleman from Indiana, Mr. Roemer.

Mr. **Roemer**. Thank you, Mr. Chairman. I would like to join with my colleague from Oregon in saluting and commending you and the ranking member for your foresight and diligence in pursuing this matter. As a member of the Education and Labor Committee, we have been working on many similar problems and looking through our hearing process at what we are now calling, not non-traditional students going to two-year schools, but new traditional students going to two-year schools. This is a problem that we face in terms of demographic explosion for more and more of our students attending these two-year schools and community schools, trying to get training in the sciences.

I would like to also commend our colleagues, Mr. Hoagland and Mr. Price, for their input and time here this morning. I attended a hearing down in Mr. Price's district on education with the Reauthorization of the Higher Education Act, and I am very much looking forward to hearing his insight and also the articulation from Mr. Hoagland from Nebraska as well.

Mr. Chairman, in conclusion, on the editorial page of this morning's "Washington Post," one of the writers talks about ways by which we address our economic woes, and they didn't talk about tax cuts for the middle class; they didn't talk about quick solutions and rhetoric; they talked about long-term solutions, such as the problem we are facing with addressing our economic competitiveness and trade problems, our educational reform problems, our high wages/low skills dilemma, and looking at civilian training in the sciences so that we can get technology off the shelves into the commercial sector and trade this technology as a final product with other countries.

These are some of the long-term solutions that we need to look at. I very much look forward to hearing our astute colleagues talk about some of these solutions today before us. I do ask, Mr. Chairman, to revise and extend and submit a statement for the record.

Mr. Boucher. Without objection, the gentleman's statement and the statement of any other Members who desire to submit them will be included in the record.

[The prepared statements of Mr. Packard and Mr. Costello, plus the *Washington Post* article follow:]

STATEMENT OF
THE HONORABLE RON PACKARD
SCIENCE SUBCOMMITTEE
HEARING ON SCIENCE AND TECHNOLOGY EDUCATION IN TWO-YEAR COLLEGES

9:30 A.M., 2325 RHOB
NOVEMBER 18, 1991

THANK YOU MR. CHAIRMAN,

I JOIN THE CHAIRMAN IN WELCOMING THE DISTINGUISHED PANEL OF WITNESSES WHO HAVE COME TO TESTIFY TODAY -- IN PARTICULAR I WOULD LIKE TO RECOGNIZE MR. PRICE AND MR. HOAGLAND -- WHOSE BILLS WE WILL BE REVIEWING.

TWO-YEAR COLLEGES REPRESENT A SIGNIFICANT EDUCATIONAL RESOURCE IN THIS COUNTRY -- WITH OVER 40% OF ALL COLLEGE STUDENTS ATTENDING A COMMUNITY COLLEGE. GIVEN THIS STATISTIC, I PRAISE THE CHAIRMAN FOR HOLDING THIS HEARING ON A TOPIC THAT WILL GIVE US INSIGHT INTO THE TECHNICAL CURRICUL~~UM~~A AVAILABLE AT COMMUNITY COLLEGES.

I BELIEVE THAT THE NATIONAL SCIENCE FOUNDATION DOES HAVE A ROLE TO PLAY IN ENHANCING THE SCIENCE AND MATHEMATICS PROGRAMS AT TWO-YEAR COLLEGES. IT IS MY UNDERSTANDING THAT NSF WAS OPPOSED TO H.R. 2936 WHEN THE AGENCY WAS CALLED TO TESTIFY BEFORE THE TECHNOLOGY AND COMPETITIVENESS SUBCOMMITTEE DUE TO THE BILL'S NARROW FOCUS. I WILL BE INTERESTED TO HEAR ABOUT THE CURRENT PROGRAMS AT NSF THAT MAY ALREADY HAVE A DIRECT IMPACT ON ADVANCED TECHNOLOGY EDUCATION AT TWO-YEAR COLLEGES.

ONCE AGAIN I WOULD LIKE TO THANK THE CHAIRMAN FOR HOLDING THIS HEARING.

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OPENING STATEMENT OF U.S. REPRESENTATIVE JERRY F. COSTELLO (D-IL)

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

SUBCOMMITTEE ON SCIENCE

"SCIENCE AND TECHNOLOGY EDUCATION IN TWO-YEAR COLLEGES"

NOVEMBER 19, 1991

MR. CHAIRMAN, THANK YOU FOR CALLING THIS HEARING. I AM PLEASED TO BE HERE AS WE DISCUSS SCIENCE AND TECHNOLOGY EDUCATION IN TWO-YEAR COLLEGES. I WOULD LIKE TO TAKE THIS OPPORTUNITY TO WARMLY WELCOME OUR PANEL OF WITNESSES. I WOULD ESPECIALLY LIKE TO WELCOME DR. CARY ISRAEL FROM ILLINOIS. DR. ISRAEL IS THE DIRECTOR OF ILLINOIS COMMUNITY COLLEGE BOARD IN SPRINGFIELD.

MR. CHAIRMAN, THE GROWTH OF TWO-YEAR COLLEGES HAS BEEN ASTOUNDING. IN 1964 THERE WERE 637 TWO-YEAR COLLEGES, BY 1984, THE NUMBER HAD DOUBLED TO 1272. OVER 40% OF ALL COLLEGE FRESHMEN AND SOPHOMORES ATTEND TWO-YEAR COLLEGES. ALL TOO OFTEN, HOWEVER, TWO-YEAR COLLEGES ARE NOT GIVEN THE RECOGNITION AND CREDIT THAT THEY WELL DESERVE.

MORE THAN OTHER HIGHER EDUCATION INSTITUTIONS, TWO-YEAR COLLEGES RELY MAINLY ON STATE FUNDING. WITH AN AVERAGE TUITION OF $900, THESE COLLEGES DEPEND ON STATE FUNDING FOR OVER TWO-THIRDS OF

THEIR BUDGET. IT HAS BEEN BROUGHT TO MY ATTENTION THAT TWO-YEAR COLLEGES ARE IN NEED OF EXPANDING AND UPDATING THEIR SCIENCE AND TECHNOLOGY PROGRAMS. BECAUSE SUCH PROGRAMS ARE MORE COSTLY, REQUIRING EXPENSIVE MODERN EQUIPMENT, TWO-YEAR COLLEGES ARE AT A DISADVANTAGE TO THOSE INSTITUTIONS WHICH HAVE HUGE ENDOWMENTS AND HIGH TUITIONS.

I AM ANXIOUS TO HEAR THE RECOMMENDATIONS OF OUR PANEL ABOUT HOW THE FEDERAL GOVERNMENT CAN BETTER ADDRESS THE ISSUE OF SCIENCE AND TECHNOLOGY EDUCATION IN TWO-YEAR COLLEGES. TWO BILLS WILL BE REVIEWED. I AM EAGER TO DISCUSS THE PROVISIONS OF THIS BILL, AS I BELIEVE THAT IMPROVEMENT IN THE AREA OF SCIENCE AND TECHNOLOGY EDUCATION IS NECESSARY FOR THE FUTURE OF OUR EDUCATIONAL SYSTEM.

AGAIN, MR. CHAIRMAN, THANK YOU FOR CALLING THIS HEARING AND FOR YOUR CONTINUED LEADERSHIP OF THIS SUBCOMMITTEE.

THE WASHINGTON POST
TUESDAY, NOVEMBER 19, 1991 A21

Robert Kuttner

Economy: A Lot Could Be Done

Many politicians have reluctantly concluded that the present basic direction of economic policy is the only possible path. The deficit precludes new public spending, the fear of inflation prevents lowering of interest rates. We can debate whether the rich should pay a bit more in taxes and the middle class less, or whether we want a slightly bigger peace dividend. But for the most part, there seems no fundamental alternative to the nation's overall economic course.

Those who accept that premise have been looking in the wrong places. Their big mistake is to assume that government policy affects the economy only through budget and monetary policy. In fact, public policy significantly affects the structure of the private economy and, hence, its competitiveness.

During the 1980s, several Democrats ran as "new ideas" candidates, but it was not clear whether those ideas had much substance. In 1984, the cartoonist Dan Wasserman lampooned Gary Hart thus:

Hart: We need some new ideas.

Citizen: Could you name one?

Hart: I just did!

But seven years later, there are ample new ideas that present vivid alternatives to official thinking. They are not merely symbolic politics or gimmickry about "the future"—but the product of hard, creative thinking. If anything, a surprising consensus exists about things that could be done if a different administration came into power. For example:

High Skills Versus Low Wages. Several study commissions have compared education and training policy in the United States and in its competitors, and found the United States wanting.

The most eloquent of these was the 1990 Report of the Commission on the Skills of the American Workforce, whose co-chairmen were Ray Marshall and William Brock. Marshall, Jimmy Carter's labor secretary, was by far the most liberal member of the Carter Cabinet. Brock, labor secretary under Ronald Reagan, also served as chairman of the Republican Party.

Yet in the report both men, and several other distinguished business, labor and educational leaders, agreed that "most American employers organize work in a way that does not require high skills. . . . America may have the worst school-to-work transition system of any advanced country. . . . The choice that America faces is between high skills and low wages. Gradually, silently, we are choosing low wages."

The commission unanimously recommended a new system that would require every high school student to obtain a Certificate of Basic Mastery. Non-college-bound young people would go on to get nationally accredited training in professional or technical skills. Employers would either provide training or contribute tax dollars to a regional training fund.

Recently a bipartisan group, led by Sen. Ted Kennedy of Massachusetts (D) and Rep. Ralph Regula of Ohio (R), introduced legislation to carry out several of the recommendations. The Bush administration opposes it.

Civilianize High-Tech Research. For decades, the secret weapon in the competitiveness of American technology has been the Cold War. The Pentagon and the Energy Department's national laboratories have contributed to U.S. technical prowess in everything from computer-controlled machine tools to supercomputers to jet airliners.

But with the passing of the Cold War, the military camouflage around our high-tech policy grows ever tattier, and the policy itself is increasingly threadbare. Sen. Jeff Bingaman, a New Mexico Democratic moderate, has been crusading almost singlehandedly to shift some of this research and development activity to civilian auspices.

Earlier legislation by Bingaman compelled the Pentagon to specify technologies that it considered critical to the national defense. These turned out to be most of high-tech industry. Now Bingaman wants us to abandon the military pretense and simply admit that technological virtue is good for the economy as a whole. His views are seconded by numerous business groups—but resisted by the Bush administration.

Universal Health Insurance. This past week, a broad coalition of blue-chip corporations, health organizations and trade unions called the National Leadership Coalition for Health Care Reform went public with its recommendations. Like most other serious people who've studied the issue, they concluded that cost containment coupled with high quality care is impossible in the absence of universal health coverage.

This particular group opted for the "play-or-pay" approach, in which employers decide either to provide their employees with a health plan or pay a tax. It's a bit unusual to see big business lobbying for new taxes and new government mandates—but these business leaders concluded that the present chaos is a far worse recipe for continued medical inflation.

As in the areas of worker training and technology policy, there is a broad consensus regarding the necessary direction of health care reform. But not at the White House.

Far from a lack of new policy ideas, a virtual compendium of well-turned reforms has accumulated during the Reagan-Bush years, awaiting only an administration with the sense to act on them.

Mr. Boucher. We welcome both of our colleagues this morning. Mr. Hoagland informs us that his committee is marking up the banking bill. Therefore, with Mr. Price's deference, we will proceed to his statement.

Peter, we are glad to have you and would be glad to hear from you at this time.

STATEMENT OF HON. PETER HOAGLAND, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEBRASKA

Mr. Hoagland. Thank you, Mr. Chairman. I certainly appreciate the opportunity to testify before you and our colleagues here at this hearing this morning. I particularly want to get back to the Banking Committee so I can give all of you an opportunity once again to be able to vote and deliberate on those interesting issues.

Mr. Boucher. The third time is the charm.

Mr. Hoagland. It really is my pleasure to bring in legislation that has been diligently developed and worked on by my staff, Linda Booth and Kathy Dyer, who are here today, legislation that had previously been carried by Doug Walgren and, also, that has considerable applicability to my district in Omaha because we have a very strong community college presence, as I know the rest of you probably have in your districts. Community college presence is extremely important to our educational structure in Nebraska. I would expect it is in Virginia and elsewhere also.

I can't speak highly enough for this particular legislation. We have well-known national problems of kinds that we have never before faced in history. We have amassed now a national debt of over $3 trillion. Recently, we exported over 5 million American jobs overseas, with 8 million Americans unable to find work now and 23 million Americans— nearly 10 percent of our people living on Food Stamps—with the fact that we have successfully converted ourselves from the world's largest creditor to the world's largest debtor nation in just 10 years.

We have monumental problems, particularly economic ones, on about every front. I think all of us agree that investing in our work force and making our workers more productive and more talented is one of the clearly identifiable objectives in working our way out of these economic problems.

I have reviewed summaries of Congressman Price's bill. I must say it is a very good piece of legislation as well.

Both of our bills do two things which I think are important. We both use the National Science Foundation as a vehicle for delivering these services. The services to be delivered are somewhat different, slightly different, but nonetheless, we both select the National Science Foundation to lead the effort.

I think that is very appropriate because of the record of that governmental agency as being one of the most experienced, one of the most effective. I remember in my senior year in high school participating in a National Science Foundation-funded physics class that was really an excellent course, much better than the course I would have received otherwise at Central High School in Omaha.

A report issued in January of 1989 by NSF identifies problems in science, mathematics, and engineering that can be met and should be met by developing more effective programs at the community college level. My bill would authorize $30 million in fiscal year 1991 and $40 million in fiscal years 1993 and 1994 for NSF to conduct national technology education programs through the community college system.

The second feature of our bills is that we use the community colleges as a basic resource, to receive these funds, to recruit students, and to implement the program. Community colleges now educate 43 percent of our post- secondary students and are really, I think, the ideal training ground for these kinds of programs.

I think, as resources become available in the 1990s because of changes internationally, this is clearly an area where America could benefit greatly by a concentration of resources. I am confident, Mr. Boucher, that after you have heard all the different proposals in this area, the committee will put one together that will have the best of all of them and will be indeed a good product. I look forward to supporting the committee's efforts when they do come to fruition on this.

I would like make my complete statement part of the record.

Mr. BOUCHER. Without objection, it will be received.

Mr. HOAGLAND. Again, I appreciate very much the opportunity to be heard on this issue. I want to be of whatever help I can in the future.

[The prepared statement of Mr. Hoagland follows:]

STATEMENT OF CONGRESSMAN PETER HOAGLAND

before the Subcommittee on Science
Hearing on Science and Technology Education in 2-Year Colleges

November 19, 1991

I would like to thank Chairman Boucher and the subcommittee for the opportunity to testify this morning on behalf of my bill to promote technology education in our community colleges. It is clear that our educational system must modernize for the workplace of tomorrow. We can no longer ignore the need to adequately train and retrain America's workforce in a competitive, international economy.

Our economy is deteriorating before us. Since the beginning of the Reagan Revolution ten years ago:

•We have amassed more than $3 trillion in national debt. The annual interest on that debt now consumes almost 15 percent of our budget and 3.5 percent of our GNP.

•We have exported 5 million American jobs in the course of transforming America from the world's largest creditor nation in 1980 to the largest debtor of 1991.

•We now have 8 million Americans unable to find work and 23 million Americans, 10 percent of our people living on food stamps.

While we spent billions fighting communism for 40 years, many of our allies spent billions preparing for the economic war of the 1990s and beyond. We have Star Wars and Stealth bombers; they have microchips and robots. They control the world's largest financial institutions.

We must make a concerted effort to invest in our students and to revitalize our educational system. Our schools should be educating students for the jobs of the future with the technology of the future to improve our productive capacity. Now is the time to provide all students -- whether young, middle-aged, elderly, full-time, part-time -- a world-class education to give them the knowledge and skills to compete. We must replace short-term fixes with a long-term view toward tomorrow.

THE NATIONAL COMMUNITY COLLEGE TECHNOLOGY EDUCATION ACT

H.R. 3606, the National Community College Technology Education Act, would create a cost-shared program in community colleges to educate people in technology fields. Grants would be administered by the National Science Foundation (NSF) to community colleges across the nation to provide technology education programs.

It is time for the National Science Foundation to lead the effort to upgrade technology education in this country. The National Science Foundation, with its experience in administering model programs on the leading edge of science and with the respect in which it is held, is the appropriate federal agency to lead this effort. A January 1989 report by NSF entitled *Science and Engineering Education in Two-Year Colleges* concluded, "Programs in science, mathematics, and engineering must be developed that are more attractive and engaging for 2-year college students." However, in 1991, the National Science Foundation is only spending $3.3 million on two-year colleges. It is time the United States invest as much in the people who work in factories and office buildings as we do in the computers and robots they have to use everyday. It is time to encourage the NSF to look at community colleges as an important national resource.

The bill would authorize $30 million in fiscal year 1992 and $40 million in fiscal years 1993 and 1994 for the National Science Foundation (NSF) to conduct national technology education programs under which accredited associate-degree-granting colleges, using matching non-federal funds, would provide education in technology fields.

The bill included several special emphases for NSF to consider in awarding grants: people in need of retraining or upgrading to retain their jobs; workers dislocated by plant closings and technological changes; working people and parents who need flexible scheduling; young people just out of high school; high school dropouts; and disabled people with special needs.

COMMUNITY COLLEGES AS A RESOURCE

Community colleges, which educate 43 percent of postsecondary students, are the ideal training ground to meet the retraining needs we face. They can offer low-cost programs with flexible scheduling. This is particularly important to adults with jobs and families. Almost 50 percent of community college students are of non-college-age. Community colleges can design education programs with local industry, such as on-the-job training, specifically designed to meet local industry's needs. They can attract faculty from industry, people who teach part-time in a field related to their work.

Two-year colleges provide access to higher education for many who might not otherwise have such opportunities and they send a large number of qualified, motivated transfer students to four-year colleges and universities.

The community college is an especially good training ground for people whose jobs are eliminated because of a plant shutdown, retooling, restructuring or changes in the economy.

Our national education policy must take advantage of one of our most powerful and natural weapons: community colleges. Study after study shows that a greater investment in our nation's most valuable resource -- human capital -- is needed to ensure a vibrant and productive economy. Community colleges are the nation's largest delivery system of training in technology education, outside of industry itself. It would be a national tragedy to overlook the great potential our vast network of community colleges.

COMPETITIVENESS REQUIRES A STRONG SKILL BASE

Many studies in recent years have pointed to the need for our country to educate more scientists and engineers, but we will never meet the competitiveness challenges posed by other countries with Ph.D scientists and engineers alone. As the workplace becomes increasingly technological, many people will need technology knowledge and skills.

A competent workforce is one of the most important factors for American economic growth and productivity in this century and it will determine the nation's economic prospects in the next. Learning on the job accounted for more than half, 55 percent, of the productivity increases in the United States between 1929 and 1989, while machine capital contributed only 20 percent. The United States must have a "backbone" of technologically-educated individuals as on the abilities of our engineers.

STUDIES SUPPORT

This bill attempts to respond to a 1991 report by the United States Department of Labor report which concluded:

> The qualities of high performance that today characterize our most competitive companies must become the standard for the vast majority of our companies, large and small, local an global....These goals are pursued by combining technology and people in new ways. Decisions must be made closer to the frontline and draw upon the abilities of workers to think creatively and solve problems. Above all, these goals depend on people....*the competence of the workforce and on responsible employees comfortable with technology and complex systems*, skilled as members of teams, and with a passion for continuous learning.

In the end, a competitive advantage does not solely come from technology, but from the people who invent and use it. I hope that my bill will be a catalyst for change, for updating our curriculum and bringing to our community colleges the incentives they need to provide students with the knowledge and skills they need in today's and tomorrow's workplace.

I applaud the subcommittee for your interest in this important area and again I appreciate the opportunity to come before you. I look forward to working with you.

Mr. **Boucher**. Thank you very much for your contribution. I realize that you have another committee that you need to attend.

Let me ask if there are members of the panel who have questions of you or who would like to make statements in response to yours this morning.

Mr. **Roemer**. Mr. Chairman, I don't have any questions, but I'm tempted to try to keep him here if it will delay our voting on another banking bill.

[Laughter.]

Mr. **Schiff**. On the contrary, Mr. Chairman, I find it great sport to vote on banking bills. I hope we'll see a number in the future.

[Laughter.]

Mr. **Boucher**. Mr. Hoagland, we thank you very much for your contribution to our deliberations this morning. We will give your legislation due consideration. Thank you.

Mr. **Hoagland**. I'm a little bit concerned about Mr. Schiff's sadistic streak.

[Laughter.]

Mr. **Boucher**. Send us a good banking bill this time. Hopefully, that will conclude the process on that.

Mr. **Hoagland**. It will be an excellent bill, believe me.

Mr. **Boucher**. Thank you very much—glad to have you with us. Mr. Price, we will be happy to hear from you.

Mr. **Price**. Thank you, Mr. Chairman. I am pleased to have this opportunity to testify on my bill, H.R. 2936, the Technical Training and Education Act of 1991. It is good to be back in this subcommittee room. I enjoyed serving on this Science Committee for a number of years. Now that I've moved on to another committee, it is gratifying to be welcomed back.

I especially appreciate the help of Chairman Boucher. In his brief tenure at the helm of this subcommittee, he has already proven to be an outstanding chairman. I appreciate the consideration that Ron Packard, the ranking Republican Member has given me on H.R. 2936.

In fact, all the members of the subcommittee have been most helpful. Almost every member is co-sponsoring this bill. I hope this indicates that we can move this legislation forward quickly because I believe it is a bill whose time has come. H.R. 2936, the Technical Education and Training Act of 1991, will substantially upgrade our educational and training efforts in science, mathematics, and technology to ensure that our work force has the skills to remain competitive in the global economy.

My legislation bolsters and strengthens our Federal efforts in work force training and education by directing the National Science Foundation to establish a competitive grants program for associate degree colleges to provide technical training and education in advanced technology fields. Awardees would use these funds to develop and disseminate model instructional programs, enter into innovative partnerships with the private sector and government agencies, improve faculty competence in advanced technology fields, and upgrade instructional laboratory equipment.

Secondly, the bill would establish 10 national centers of technical education and training. All of the centers would be associate degree-granting colleges with exceptional advanced technical training programs, science and math educational programs, or both. The idea would be to not only upgrade these 10 institutions, but to use them as clearinghouses for institutions across the country which are trying to improve their education and training programs.

The final part of the legislation directs the director of NSF to establish a program of outreach and partnership grants between associate degree colleges and four-year academic institutions to increase the number of students achieving bachelor's degrees in math, science, engineering, and technology. These grants would allow these institutions to facilitate transfer of talented students who might otherwise stop at the associate degree level by providing special counseling and academic advising, workshops, tours, and summer programs to these students.

The authorization level for all of these programs is $50 million. At the Technology and Competitiveness Subcommittee markup, an amendment was offered to ensure that this authorization would not add to NSF's existing authorization level. Since NSF's appropriations level currently falls short of this authorization level—and that's a situation I would like to do something about—I believe that appropriations can be made for the new activities envisioned by H.R. 2936 without compromising current NSF funding levels for other programs.

The need for this legislation has been well documented. Already, three out of every four new jobs in America require education or training beyond the high school degree. It is no longer a question of whether Johnny can read or write. It's a question of whether Johnny can comprehend a computer manual well enough to get a job at IBM.

The Federal response to this challenge has been, at best, inadequate. There have been scattered attempts by other agencies to address these problems, but for the most part, they have fallen short.

For example, the Department of Education's Cooperative Demonstration Program, as the charter for this hearing noted, did provide 30 grants totaling a little over $9 million in fiscal year 1990 for various high-tech training needs in areas like health care and telecommunications. However, since that fiscal year, these advanced technology training programs have not received funding for this program. In fact, for the past year, model projects involving building construction was the sole focus of that program.

The limits of the Cooperative Demonstration Program are described in detail in the excellent testimony of Valencia Community College President Gianini, who you will be hearing from later today. His college has been one of the successful ones in attracting these demonstration grants, so he is well positioned to determine the gaps that this program leaves and why H.R. 2936 is so vitally needed.

I also want to briefly respond to the Department of Education's contention in a letter to Tim Valentine, chairman of the Technology and Competitiveness Subcommittee, that the Tech Prep program largely achieves the purposes of H.R. 2936. Tech Prep is a very valuable program that links the last two years of high school with two years of community college in a sequence of courses designed to increase students' technical skills. It is designed to aid those students currently moving through elementary and high school. However, as the Department of Commerce Assistant Secretary for Policy Deborah Wince-Smith has pointed out, 85 percent of the work force for the year 2000 is already in the work force today. It is to the training needs of this larger population that H.R. 2936 reaches and Tech Prep does not.

Moreover, Tech Prep does not contain many of the programmatic elements of H.R. 2936. Tech Prep does not provide for articulation agreements between two and four-year colleges. Tech Prep does not provide for centers of excellence to ensure that all colleges have the best curricula in various technical fields available to them. Tech Prep does not provide for faculty enhancement through hands-on experience with new technology.

Tech Prep does promise to upgrade vocational education across this country. I am strongly supportive of it, but it is neither conceived nor structured to do what H.R. 2936 would do, which is to bring the resources and the expertise of the NSF to bear on the creation of state-of-the-art curricula, teaching methods, and equipment in advanced technical training, establishing centers of excellence that will have a ripple effect throughout the entire community college system.

The Department of Education's letter also mentions the establishment of the National Coalition of Advanced Technology Centers as a pretext for not moving this bill forward. While this dissemination network is important, and while H.R. 2936 in fact anticipates the presence of that network, the network will be ineffective if we don't provide funding to develop model programs in the first place, or to enhance faculty achievement, or to purchase needed equipment.

It seems self-evident that dissemination is important only if you have programs that are working and faculty who can teach them. In other words, dissemination is important only if you have something to disseminate.

The National Science Foundation's role in improving education, especially in advanced technology fields, makes their leadership in this kind of training and educational development particularly appropriate. The Foundation ignores our national deficiency in advanced technical training at the risk of its own mandate.

Our nation's leadership in science and engineering cannot be sustained unless it is supported by the best-trained technicians in the world. The research enterprise in this country depends on improving the skills of these workers, as does the successful translation of research into new products and manufacturing technologies.

In this regard, I was pleased to see NSF's supportive statements at a September 17th hearing on this bill before Mr. Valentine's Technology and Competitiveness Subcommittee. Luther Williams, who you will hear from today, testified that the programmatic concepts in H.R. 2936 are sound and that they are structured to be consistent with how NSF conducts its other programs. In response to a question from Mr. Valentine, Mr. Williams agreed to Finding Number 6 in H.R. 2936— namely, "That the National Science Foundation's traditional role in developing modern curricula and disseminating instructional materials, enhancing faculty development, and stimulating partnerships between educational institutions and private industry make an enlarged role for the National Science Foundation in technical education and training particularly appropriate." The activities envisioned in H.R 2936 clearly fall within NSF's missions, and I believe my bill charts a reasonable and modest course to enlarge NSF's involvement in these critical areas.

I commend this subcommittee for holding this important hearing this morning. I look forward to working with you as we refine this bill and, I would hope, bring it to the Floor.

[The prepared statement of Mr. Price follows:]

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Statement of Congressman David E. Price
November 18, 1991
Subcommittee on Science

I am pleased to have the opportunity to testify on my bill, H.R. 2936, the Technical Training and Education Act of 1991, before this Subcommittee. I enjoyed serving on the House Science and Technology Committee, and it's great to see many of the people with whom I have worked closely over the years.

I especially appreciate the help of Chairman Rick Boucher. In his brief tenure at the helm of this important subcommittee, he has already proven to be an outstanding chairman. I also appreciate the consideration that Ron Packard, the ranking Republican member, has given me on H.R. 2936.

I also appreciate the support of the many members of the subcommittee. In fact, almost evary member of this subcommittee has cosponsored this legislation. I hope this indicates that we can move this legislation forward quickly. It's a bill whose time has come.

H.R. 2936, the Technical Education and Training Act of 1991, will substantially upgrade our educational and training efforts in science, mathemathics and technology, to ensure that our workforce has the skills to remain competitive in the global economy.

My legislation bolsters and strengthens our federal efforts in workforce training and education by directing the National Science Foundation to establish a competitive grants program for associate-degree colleges to provide technical training and education in advanced-technology fields. Awardees would use these funds to develop and disseminate model instructional programs, enter into innovative partnerships with the private sector and government agencies, improve faculty competence in advanced-technology fields, and upgrade instructional laboratory equipment.

The bill would also establish ten National Centers of Technical Education and Training. All of the centers would be associate-degree granting colleges with exceptional advanced technical training programs, science and math education programs, or both. The idea would be not only to upgrade these ten institutions, but to use them as clearinghouses for institutions across the country

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which are trying to improve their education and training programs.

This bill is designed to take advantage of the fact that many community colleges are already actively involved in training programs. Federal assistance in taking these programs to new levels of excellence and effectiveness, and then disseminating the models and methods across the country, would be a wise investment.

The final part of the legislation directs the Director of NSF to establish a program of outreach and partnership grants between associate-degree colleges and four-year academic institutions to increase the number of students achieving bachelor degrees in mathematics, science, engineering, and technology. These grants will allow these institutions to facilitate transfer of talented students who might otherwise stop at the associate-degree level, by providing special counseling and academic advising, workshops, tours, and summer programs to these students.

The authorization level for all these programs is $50 million. At the Technology and Competitiveness Subcommittee markup, an amendment was offered to ensure that this authorization would not add to NSF's existing authorization level. Since NSF's appropriations level currently falls short of this level, a situation I would like to do something about, I believe appropriations can be made for the new activities envisioned by H.R. 2936 without compromising current NSF funding levels for other programs.

The need for this legislation has been well-documented. Already, three out of every four new jobs in America require education or training beyond a high school degree. It's no longer just a question of whether Johnny can read or write, but whether Johnny can comprehend a technical manual well enough to get a job at IBM.

The federal response to this challenge has been, at best, inadequate. As Erich Bloch, former director of the National Science Foundation acknowledged before this Committee in 1990, adult science and technical training are areas that are falling through the cracks of the federal education effort. Supporting Director Bloch's contention is a Sunbelt Institute study: "Federal programs", it concludes, "should aim to help adult education programs transcend their emphasis on general education and their historic isolation, and to overcome their lack of resources and expertise to address the literacy demands of the workplace."

There have been scattered attempts by other agencies to address these problems, but for the most part, the attempts have fallen short. For instance, the Department of Education's Cooperative Demonstration Program (High Technology), as the charter for this hearing noted, did provide 30 grants totaling a little over $5 million in FY1990 for various high-tech training needs in areas like health care and telecommunications. However, since that fiscal year, these advanced technology training programs have not received funding from this program. In fact, for the past year, model projects involving building construction was the sole focus of the program.

The limits of the Cooperative Demonstration Program are described in the excellent testimony of Valencia Community College's President Gianini, whom you will hear from later today. His college has been successful in receiving these demonstration grants, and he is well-positioned to detail the gaps this program leaves and why H.R. 2936 is so vitally needed.

I also want briefly to respond to the Department of Education's contention in a letter to Tim Valentine, chairman of the Technology and Competitiveness Subcommittee, that the Tech Prep program largely achieves the purposes of H.R. 2936. Tech Prep is a very valuable program that links the last two years of high school with two years of community college in a sequence of courses designed to increase students' technical skills. It is designed to aid those students currently moving through elementary and high school. However, as the U.S. Department of Commerce Assistant Secretary for Policy, Deborah Wince-Smith, has pointed out, 85% of the workforce in the year 2000 is already in the workforce today. It is to the training needs of this larger population that H.R. 2936 reaches and Tech Prep does not.

Moreover, Tech Prep does not contain many of the programmatic elements of H.R. 2936. Tech Prep does not provide for articulation agreements between two- and four-year colleges to increase the number of bachelor degrees in math, science and engineering. Tech Prep does not provide for Centers of Excellence to ensure that all colleges have the best curricula in various technical fields available to them. Tech Prep does not provide for faculty enhancement through hands-on experience with cutting edge technology. Tech Prep promises to upgrade vocational education across this country, but it is neither conceived nor structured to do what H.R. 2936 would do: to bring the resources and expertise of the NSF to bear on the creation of state-of-the-art curricula, teaching methods, and equipment in advanced technical training, establishing centers of excellence which will have a ripple effect through the entire community college system.

The Department of Education's letter also mentions the establishment of the National Coalition of Advanced Technology Centers as a pretext for not moving this bill forward. But while this dissemination network is important, and anticipated by H.R. 2936, it will be ineffective if we do not provide funding to develop model programs, enhance faculty achievement, and purchase needed training equipment. It seems self-evident that dissemination is important only if you have programs that are working and faculty who can teach them -- only, that is, if you have something worthwhile to disseminate.

The National Science Foundation's role in improving education, especially in advanced-technology fields, makes their leadership in this kind of training and education development particularly appropriate. The Foundation ignores our national deficiency in advanced technical training at the risk of its own mandate. Our nation's leadership in science and engineering cannot be sustained unless it is supported by the best-trained technicians in the world. The research enterprise in this country depends on improving the skills of these workers, as does the successful translation of reserch into new products and manufacturing technologies.

In this regard, I was pleased to see NSF's supportive statements at a September 17th hearing on this bill before Mr. Valentine's Technology and Competitiveness Subcommittee. Luther Williams, whom you will hear from today, testified that the programmatic concepts in H.R. 2936 are sound and that they are structured to be consistent with how NSF conducts their programs. And in response to a question from Mr. Valentine, Mr. Williams agreed to finding #6 in H.R. 2936: "The National Science Foundation's traditional role in developing modern curricula and disseminating instructional materials, enhancing faculty development, and stimulating partnerships between educational institutions and private industry makes an enlarged role for the National Science Foundation in technical education and training particularly appropriate." The activities are envisioned in H.R. 2936 clearly fall within NSF's mission and I believe my bill charts a reasonable and modest course to enlarge NSF's involvement.

I commend this Subcommittee for holding this important hearing. I look forward to working with you.

Mr. Boucher. Thank you very much, Mr. Price. You have made a very substantial contribution to this national effort to ensure that America has a well trained work force sufficient to the demands of the coming century. We all commend you for that effort. I think that is an undertaking that we all endorse.

On the other hand, questions will be raised as to what is the most appropriate means to achieve that goal. I notice that in your statement you have suggested that the Department of Education's programs are not adequate to meet that need, certainly not as currently structured or funded.

Do you think that, if the current programs that are authorized for the Department of Education were in fact properly funded, that the need could be met that way without involving the National Science Foundation, or, even if those programs were fully funded, do you think some NSF contribution to this effort would be required along the lines of what you recommended in your bill?

Mr. Price. I think some NSF involvement is very important at this stage, both because of the inherent shortcomings in the concept and the execution of these Department of Education programs, and also because of the positive potential that we have at NSF.

We have thought a lot about the question that you raise. We have not lightly assigned this program to NSF and we have not lightly disregarded the Department of Education efforts. We commend those efforts, Tech Prep in particular. We want to make that just as strong and effective and we can. I have worked on that program as well and I support it very strongly.

What we need in addition to assisting educational institutions across the country in upgrading their programs is to provide some pilot efforts, some demonstration efforts, in a relatively small number of institutions that will show what we are capable of and develop these state of the art curricula, teaching methods, and model partnerships that can then be disseminated throughout the system. That is not going on anywhere else. That is what NSF does so well in other scientific areas, and it is what we think needs to be done with advanced technical training.

One aspect of my full statement, which will be in the record, I presume, but that I did not take your time with here this morning, has to do with a hearing in this committee a year ago. Mr. Boehlert was there. I remember his congratulating Erich Bloch and Secretary Cavazos for getting together finally. He said we had broken down the barriers in Eastern Europe and across the world, and now we've gotten the Department of Education and the National Science Foundation together to talk about their coordinated efforts in education.

My question to the two of them was: what are neither of you doing? What's falling through the cracks in terms of both agencies' involvement? Erich Bloch answered instantly: advanced technical training is falling through the cracks. That's where neither of us are doing the job that needs to be done, and that is the gap that this bill sets out to fill.

Mr. Boucher. Thank you very much for that answer. Without objection, your statement and the prepared statement of all the witnesses that appear this morning will be made a part of the record.

The gentleman from California, the ranking Republican member of this subcommittee, Mr. Packard.

Mr. **Packard**. Thank you, Mr. Chairman.

I really don't have a question, Mr. Price. I want to commend you for your legislation and your interest in this particular area where I agree with you that there is much more that we can be doing. Certainly, the community colleges around the country are playing a vital role in preparing and educating our young people and, if in fact we are seeing a weakness in this area, there ought to be some effort to bridge that gap. I want to thank you very much.

Mr. **Price**. Thank you.

Mr. **Boucher**. The gentleman from Indiana, Mr. Roemer.

Mr. **Roemer**. Mr. Chairman, I ask unanimous consent— this committee staff is on top of things as always, and the article that I mentioned in my opening statement in today's "Washington Post," they gave me a copy of—so I ask unanimous consent that a copy be included with my opening statement.

Mr. **Boucher**. Without objection.

Mr. **Roemer**. Thank you.

I would like to thank you for appearing before the committee today, Mr. Price, and always for your fine testimony. As a co-sponsor of this legislation as well, I would just like, for the record, to highlight your distinction here in your testimony between what Tech Prep does not provide and what this bill does provide, specifically for centers of excellence.

If you could, just go over in a little bit more explanation for me and for the committee to talk about providing the best curricula in various technical fields for these schools, how NSF will work on those kinds of recommendations, and let me just tell you why I'm concerned about this. I really think we need to forge better relationships and partnerships between our educational institutions and private industry.

To give you an anecdote from my particular district, I recently had a businessman come up to me and complain that he had tried to hire 11 high school graduates from my community high schools and none of them passed his test. He went on and on profusely to complain about the process and said that the high schools as well as the two-year schools in our district were not meeting the needs of the local industry.

One of the things that the business leaders can do is work with the schools to give feedback to the schools on what exactly the shortfalls in skills are. They can develop recommendations in curricula. They can develop apprenticeships and internships, bringing the workplace to the schools and schools to the workplace.

I think what your legislation does is institutionalize that through the educational process. If you could explain that a little bit more in terms of what Tech Prep does not provide and what your bill does, I sure would appreciate that.

Mr. **Price**. Thank you. I do appreciate your interest in this and your support for what we're trying to do. I can only agree with what you said about the business community.

In my district for some years now, if you sit business leaders down in a room and ask them what their number one issue is, they will tell you education immediately. I don't think there is any question that the business community is well aware of our work force deficiencies and our need to remedy those.

My own wake-up call in this regard occurred very early in my tenure in the Congress. Doug Walgren brought the Science Subcommittee down to our district and we heard testimony from executives in the Research Triangle Park, one of whom testified very forcefully about this matter and indicated to us that right then he wasn't hiring anyone without two years past high school and, in those cases, that was often needed to supplement the kind of training that those people brought to the workplace. Well, that's where this country is going and that's where our new jobs are going to be, so we need to respond to this.

Now, Tech Prep is a response on one level to that challenge. We need desperately to upgrade vocational education in this country. Tech Prep is going to help us do that by linking the last two years of high school and the first two years of college.

Tech Prep, of course, is a very broad program which will provide assistance to a number of institutions as they attempt to bring those programs up to speed. We need to support that effort fully, but Tech Prep is not doing what this bill envisions, which is to take a very few centers of excellence and really make them models for all the rest.

That is what NSF does best. It fits perfectly the NSF model of how we move ahead and how we disseminate results of model efforts, demonstration efforts.

What we are attempting to do is to apply this in this widening field of advanced technical training. The bill does include some specifics as to the kinds of fields that we have in mind, laser technology, electronics, robotic technology, nuclear technology, computer technology, fiber optics, advanced manufacturing technology, advanced health technologies, and advanced technology applications that integrate and synthesize emerging and existing technologies. Just to read that list indicates the kind of challenge that we face.

One way to conceive of it, I think, is of that area between vocational education, even upgraded vocational education, between that and classical math, science, and engineering education—that area between those two which we have not attended to sufficiently, which is growing in the number of jobs that it involves and its importance to our country. That is what we're trying to address.

It is not a huge grant and aid program that we have in mind. We are not going to be disseminating large amounts of money to large numbers of institutions. That is the business of other programs and other agencies. What we are doing is taking a very few institutions and making them models for the rest.

Mr. ROEMER. Thank you, Mr. Chairman.

Mr. BOUCHER. The Chair thanks the gentleman and recognizes the gentleman from New York, Mr. Boehlert.

Mr. BOEHLERT. Thank you, Mr. Chairman.

I wish to thank our colleague from North Carolina for his stick-to-it-iveness in this battle. I think you've got good legislation and I want to see it become a reality.

As you know, I'm a cheerleader for the National Science Foundation. I think it is one of the best that we have to offer the American people in terms of its outstanding performance.

There are two statements in your full text that I am very pleased to repeat. One is that you envision an enlarged role for the National Science Foundation in technical education and training; that you think it is particularly appropriate. The second part—and this is very important because you can't have one without the other, like bacon without eggs—is that I believe appropriations can be made for the new activities envisioned by H.R. 2936 without compromising current NSF funding levels for other programs. That is critically important. This will not replace any existing programs. This will supplement existing programs.

I think you are right on with your focus at the National Science Foundation rather than the Department of Education. I'm encouraged that we can have a better relationship between the two, but I think that in this instance, the NSF is the proper vehicle to carry forward your very fine program. I am pleased to identify with it and I want to commend you publicly.

Mr. PRICE. Thank you. I appreciate your leadership over the years, Mr. Boehlert. You and Doug Walgren gave such able leadership to the Science and Research Committee for many years when this proposal and others like it were being developed.

What we have before us today represents the result of those years of discussion and refinement. Nothing is in here by accident. We have really thought long and hard about where this responsibility ought to be lodged and how it can be done to maximum effect.

I appreciate your work on this and look forward to working with you to move it along further.

Mr. BOUCHER. Mr. Price, we thank you very much for your presence here this morning. You have certainly given us a lot to chew on, and we will consider your legislation and your statement very carefully as this subcommittee continues to examine ways to enhance the capabilities of America's work force. With that statement, we will excuse you this morning.

Mr. PRICE. Thank you very much.

Mr. BOUCHER. The subcommittee now welcomes our second panel of witnesses comprised of Dr. Luther Williams, the Assistant Director for Education and Human Resources at the National Science Foundation.

Dr. Williams, your prepared written statement will be made a part of the record and we would welcome your oral summary.

STATEMENT OF LUTHER S. WILLIAMS, ASSISTANT DIRECTOR FOR EDUCATION AND HUMAN RESOURCES, NATIONAL SCIENCE FOUNDATION

Dr. WILLIAMS. Thank you, Mr. Chairman and members of the committee.

It is a pleasure to be here today to participate in this hearing. The committee's concern for the issue of technology and science education and for the important role that must be played by the Nation's two-year colleges is both critical and timely.

I want you to know from the start my views on H.R. 2936 and H.R. 3606. H.R. 2936, since I was here in September, has been substantially revised. The statement of actions needed to improve technical education in the United States has been greatly refined and now provides more broadly-based descriptions.

The National Science Foundation agrees with the intent, that is, the programs to be addressed under this legislation. We still oppose the bill even as revised because additional legislative authority is not needed and, to some extent, because of it's narrow focus. Predictably, we would have similar problems with H.R. 3606.

We believe that the foundation's ongoing effort in this area ought to be broadly-based along the lines that I will describe in a moment, and we suggest that a narrow targeted effort would come at the expense of a broadly-based program that would ensure proper attention to moving targets. What is meant by that is: technology and training are both rapidly moving targets because of their strong ties—understandably so—to local concerns.

The explication of these reviews constitutes in effect the major body of my oral comments, in which I would like to sketch what the foundation's Directorate for Education and Human Resources is doing to support and advance technical education, and make some specific suggestions on how that role properly and appropriately should be extended.

This committee has recognized the need for current emphasis on technology and science education at the two-year college level. Currently, the foundation is studying many aspects of its role in improving math, science, and technology literacy and capability for all students. One of the important aspects of this current effort is directed toward two-year colleges with specific emphasis on improving the quality of their instructors.

The foundation's role: It is appropriate that the foundation play a substantial role in improving the qualifications of America's technologists and production workers. The foundation believes its capabilities and resources are best employed in efforts to improve broad and general technical skills, background, and competency rather than supporting improvement in training students for jobs which may have a short lifespan.

The role of the two-year colleges: All of American colleges and universities are called on to respond to the need of an ever-changing population and work force, but it is the two-year colleges that are ideally positioned to serve as a catalyst for improving post-secondary education that is required to meet the demands, the level, and the kind of technical education now being required by industry to staff the productive phase of a competitive cycle.

To be sure, NSF intends to play a major role in strengthening math and science programs at two-year colleges. Such strengthening will yield the production of triple dividends. First, many students enrolled in such programs will be ready to embark on careers in the industrial work force; that is, upon the receipt of an associate degree. Many others will continue their education in pursuit of a bachelor's degree in science, engineering, and technology by the appropriate articulation between two-year and four-year institutions. Still others will have acquired useful skills and familiarity with science and mathematics.

Two-year colleges obviously are a vitally important resource for the reasons that have been indicated. They assist many students, some of which are academically unprepared to begin their college work. They are important in the sense that they offer instruction of high quality and variety and a variety of support systems, and obviously, they are more economical in the sense of proximity to students' residences as contrasted with four-year institutions.

What are the problems as we see them with two-year or associate degree-level science, mathematics, and technical education? The problems are in fact very similar to the entire enterprise.

One is keeping the faculty up to date in their fields, developing courses and curricula that will attract and properly train the students, developing the laboratory components to science, engineering, math, and technology programs. Next, making sure that there is effective articulation between not only associate degree institutions and four-year institutions but also between high schools and two-year institutions—both articulations.

What is NSF doing as bears on the two-year institutions? Two-year colleges, as you know, are eligible for support directly from all of the programs of the Education and Human Resources Directorate. While in fact the level of support for such institutions has been less than desirable, it is receiving increased attention.

The programs under which two-year institutions are supported exactly match the areas of concern. I said the areas of concern were faculty, laboratories, and instrumentation, the points emphasized in particular that would deal with the 10 demonstration centers.

Instrumentation and laboratory development: This is designed to improve the quality of undergraduate laboratory instruction in all science, engineering, and mathematics courses and includes the two-year college sector. For the last fiscal year, the foundation made 53 grants to two-year colleges totaling nearly $2 million.

The second issue is undergraduate faculty enhancement. This is an effort to improve the disciplinary capabilities and the teaching skills of faculty members who are primarily involved in undergraduate instruction. While in fact only a few two-year colleges received grants, the grants we made to other institutions benefitted two-year science, math, and technology faculty. In fact, they accounted for 20 percent of all faculty served under the faculty enhancement program in the last fiscal year.

Our major focus on courses and curricula is entirely devoted to the first two introductory years of the collegiate sequence, so by definition, they are exactly equal to the needs, interests, and course offerings of two-year institutions. We also offer with respect of high school to the two-year college transition, a hands-on research enrichment program for hireability of high school students, and we've made several grants to two-year institutions.

To ensure substantial involvement from the private sector through the Private Sector Partnership Program, we are supporting the linkage of the intellectual capital from business and industry with science and mathematics at the K - 12 sector in creating consortia in a variety of settings. These programs we recognize, while they match well with the needs of the institutions, are not really sufficient. In recent years—particularly the last year—we have made a serious effort to expand the involvement of two-year college faculty in the NSF program as grant recipients.

We have held a major workshop in which we had faculty members from two-year institutions to inform the foundation of needs as viewed by those faculty members. That has culminated in a report, the results of which will be available soon, and we will share that with this committee.

We have entered a formal agreement with the American Association of Community and Junior Colleges to bring to the foundation faculty members in mathematics, science, engineering, and technology in order to afford them the opportunity to learn the operation and nuances of the foundation in order to assist them in being more effective in competing for resources. We have two such individuals in the foundation currently as interns, a math professor from Montgomery Community College in Maryland and a math professor from Tri-County Technical College in South Carolina—the first two efforts.

I just recently added two faculty members, one of which is the President of the Montgomery County, Maryland Community College, to the National Advisory Committee of the Education and Human Resources Directorate in order that those individuals will have a direct role in influencing programs and policies of the directorate.

We commend this subcommittee for its effort to stimulate the improvement in technological literacy and competency in this country. The NSF fully supports the finding of both of these bills. This position depends on substantially upgrading and coordinating our efforts in science, mathematics, and technology, especially at the associate degree level.

The early section of this testimony shows that NSF is convinced of the important roles of the two-year colleges, the role that they play in educating the scientific and technical work force, and we are committed to ensuring adequate and appropriate responsiveness and participation by community, junior, and technical institutions to the programs of the foundation.

In closing, I reiterate the last comment made on the quote of me at the September hearing that was in Congressman Price's testimony. Nothing has changed.

[The prepared statement of Dr. Williams follows:]

DR. LUTHER S. WILLIAMS
ASSISTANT DIRECTOR FOR EDUCATION AND HUMAN RESOURCES
HEARING BEFORE THE
SUBCOMMITTEE ON SCIENCE
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES
NOVEMBER 19, 1991

Mr. Chairman, I testified earlier on H.R. 2936 so much of my remarks will be unchanged. This Committee has recognized the need for increased emphasis on technology and science education at the two-year college. Currently, the National Science Foundation (NSF) is studying many aspects of its role in improving the science, mathematics, and technology literacy and capability of ALL students; one of the most important of these aspects is helping two-year colleges improve the quality of their instruction so as to increase their effectiveness in developing the capabilities of their students -- who are the nation's citizenry, in general, and its technical workforce, in particular.

In May of this year, as one step in this process, the NSF sponsored "The National Science Foundation Workshop on Science, Engineering, and Mathematics Education in Two-Year Colleges." Much of what I have to say today proceeds from the reports of that and similar NSF workshops and from a status report on the same topic prepared by American Association of Community and Junior Colleges (AACJC) with NSF support.

The National Science Foundation's programs in both education and research have made major contributions to the efforts that result in the production of highly skilled scientists and engineers by American schools, colleges, and universities. Many of these programs contribute also to the early education of successful business managers and financial experts. It is not inappropriate that NSF play a role in improving the qualifications of America's technologists and production workers.

It is clear that the nation's vision must be enlarged to include sound scientific, mathematical, and technical education for ALL students, especially for those who will enter the critical segment of the workforce that handles the production phase of the competitive cycle. It is on these men and women that responsibility falls to maintain the efficiency and quality in producing the goods and services that compete effectively in the international marketplace.

The effectiveness with which the schools and colleges of the nation prepare its workforce in science, mathematics, engineering, and technology relates directly and immediately to its economic, political, and intellectual health. In the precollege arena, there are many signs that the mathematics and science communities have begun to take seriously their roles to advance the science, mathematics, and technical literacy and capability of ALL students. This Committee has been very supportive of NSF's proposals at the precollege level.

The National Science Foundation believes that its capabilities and resources are best employed in efforts to improve the broad and general technical skills, the competencies, called for in reports such as that of the Secretary's Commission on Achieving Necessary Skills for America 2000 (SCANS), rather than in supporting improvements in training students for specific jobs which may have a short lifespan.

A large and ever-increasing fraction of industrial and institutional jobs now require some significant postsecondary education; traditional skills are no longer sufficient to meet the demands of the workplace. Today's worker (and certainly tomorrow's) must have not only broad and serviceable basic skills but advanced thinking and problem-solving skills as well. Equally important, today's worker must exhibit such personal qualities as a well-developed sense of responsibility, the ability to participate in team efforts, firm self-esteem, and demonstrable success in self-management.

While all of America's colleges and universities are called upon to respond to the needs of an ever-changing population and workplace, its two-year colleges are ideally positioned to serve as catalysts for improving the postsecondary education required to meet the demands of the levels and kinds of technical education now being required by industry. Increasingly, the two-year colleges play a significant role in the early collegiate training of higher level scientists and engineers because they address the educational needs of the whole of America's diverse population.

NSF has a role to play in strengthening the science and mathematics programs at two-year colleges which are essential elements of high quality technology education and technician training. Such strengthening will yield double dividends: many graduates of such programs will be ready to embark immediately on careers in the industrial workforce; and, many others will continue their education in pursuit of baccalaureate degrees in science, engineering, and technology.

TWO-YEAR COLLEGES AS A RESOURCE

There are over 1400 two-year colleges in the United States -- 70 percent public and 30 percent private; together they enroll nearly 5 million students. Their student bodies contain over half of the minorities in higher education and about 40 percent of all college students. While these institutions serve a variety of purposes for students, they all have a single dominant mission -- instruction.

Two-year colleges bring important strengths to the development of the nation's human resources for learning and work in science, mathematics and technology:

- they provide access to higher education for many who might not otherwise have such opportunities;
- they support a great diversity of learning purposes and related environments ranging from personal growth and career-oriented courses, through academic remediation and numerous technical education curricula, to courses constituting the first two-years of work for students who will transfer to four-year colleges and universities; and,
- they enroll very large numbers of minority and low-income students.

The two-year colleges play three important roles that are important in a climate of changing demographics and workplace needs:

(1) They supply a large number of technologists who enter the job market directly from an associate degree or certificate program.

(2) They send a large number of qualified, motivated, and successful transfer students to four-year colleges and universities. (The majority of students who chose teaching as a career use this route and meet their science and mathematics requirements in the two-year college.)

(3) They take their service to their surrounding communities seriously -- by offering a wide variety of courses designed to help the workforce upgrade and renew job skills and develop new skills. (In a typical night class at a community college, more than half the class might already have four-year degrees. They return because their jobs demand new skills.)

There are important reasons why the two-year college is the college of choice for many students, including minorities. Two-year colleges can help students who are academically underprepared to begin college work. Because two-year schools are in the communities where students live, costs of attendance are usually considerably less than at four-year institutions, and propinquity permits students to combine work and study; often, such schools are the only financially viable option for many first-time and most non-traditional students. Finally, students attend two-year colleges because of the quality of the instruction, wide variety of programs, and support services offered.

Problems in science, engineering, mathematics, and technologies education at two-year colleges are analogous to those of many four-year institutions: keeping faculty up-to-date in their fields; developing courses of study that attract and retain students, particularly minorities and women; developing the laboratory component of science, engineering, mathematics, and technology programs particularly in these times of limited available resources; and making sure that there is a strong articulation program between high schools and colleges in science, mathematics, and technology. Very importantly, there is also a need to improve the interface between two and four-year schools in terms of course development, transfer of students, and use of technology.

Limited professional development opportunities, heavy teaching loads as well as committee and departmental assignments, lack of emphasis on research, and often small numbers of faculty members in a particular scientific department keep many two-year college faculty in isolation from the mainstream of their science, mathematics, engineering, and technology disciplines. Faculty often lack the time, funds, and access to collegial interactions necessary to develop scholarly pursuits which would keep them attuned to new discoveries in their disciplines as well as new ways of teaching and learning which are changing rapidly due to instructional technology, an emphasis on applied problems, and a changing population who have been shown to learn in qualitatively different ways from traditional groups.

The staff at NSF, particularly in the Directorate for Education and Human Resources (EHR), is aware of and sensitive to the situation faced by two-year college faculty. Faculty at two-year colleges have little experience or tradition developing proposals such as NSF requires in its merit-based review processes. This is not surprising given the mission of two-year colleges, the work load of the faculty, and the lack of institutional support.

The recent workshop we sponsored addressed how not only NSF, but also two-year college faculty, professional organizations, two-year college presidents and administrators, local and state funding agencies, and other federal agencies, can work together to increase the role that two-year colleges play in improving science, engineering, mathematics, and technology education at all levels. The report will be published shortly, and we will share it with you. NSF has also been working extensively with the American Association of Community and Junior Colleges (AACJC) and discipline-based community college groups in mathematics, science, engineering, and technologies. Outreach activities have had the dual goal of better acquainting faculty with available NSF programs and improving the understanding of NSF with regard to two-year colleges. Together this now forms a basis for NSF to use to work with faculty and administrators in two-year colleges as programs are developed to improve the quality of educational activities in science, engineering, mathematics, and technologies. Already the number of projects in two-year colleges and technology education is increasing.

NSF has directly and quickly responded to many of the recommendations of this 1991 workshop. These activities and programs are based on a systematic approach to analysis of the nature, goals, and needs of two-year colleges and are being developed in coordination with AACJC and discipline based professional organizations. For example, NSF has entered into a project with AACJC to create a cadre of "NSF-AACJC Fellows" whereby two-year college faculty will spend time in all five divisions of EHR learning about procedures, policies, and programs and providing outreach to two-year colleges across the country. In addition, the Advisory Committee for the Directorate for Education and Human Resources has added two members from two-year colleges.

The National Science Foundation - A Targeted Role

The appropriate role for the National Science Foundation is one of intellectual and substantive leadership. The Foundation is able to draw upon its position in the science, engineering, and mathematics education and research communities to provide leadership, developmental support, and intellectual resources to strengthen two-year college science, engineering, mathematics, and technology and the preparation of students graduating from high school. The Foundation's leadership will be most effective in making sure that the quality of funded programs is consistent with sound scientific and engineering principles.

The NSF fully understands the Committee's desire to support programs that will lead to a more technologically capable workforce. Immediate attention needs to be drawn to the issues which most dramatically affect the quality of instruction and instructional programs in science, engineering, mathematics, and technology. Two-year colleges are ideally positioned to serve as catalysts for educational improvement and to address the national concern for literacy. The two-year college specifically provides for accessibility, comprehensive services, and for quality undergraduate education, making it an effective agent for change.

NSF is focusing on five key areas. These areas are curricular reform and program improvement; professional development and renewal opportunities for faculty; the increasingly diverse and often academically unprepared student population; partnership strategies that would expand linkages with elementary and secondary education as well as four-year colleges and universities; and the need for active alliances among two-year colleges, private sector business, and industry. The Foundation has broad program authority for activities in these areas. Several of our current efforts at two year colleges are highlighted in the additional material submitted for the record.

Comments on National Technology Education Legislation

The Chairman should be commended for his concern for the improvement of technological literacy and competency in the United States. NSF fully supports the goals of HR 2936 and HR 3606, particularly the articulation of the important role that two-year colleges play in the education of the nation's undergraduates, especially since community, junior, and technical colleges often serve as institutions of choice to minority and other underrepresented student populations.

Participants in the 1991 workshop mentioned earlier, rather than recommending sheltered programs, clearly called for community college faculty and administrators, NSF and other national organizations, professional societies, state and local governments, secondary schools and four-year colleges and universities to work together to increase the role of community colleges in improving education in all institutions and at all levels.

It is our feeling that NSF should place its efforts on program development to provide instructional materials and faculty workshops which increase the mathematical, scientific, and technological capability for students at all levels. We want to help two-year colleges in particular to strengthen their curricular programs; to provide professional development and renewal opportunities for two-year faculty in technical, transfer, and enrichment programs; to address the diverse populations at these schools; to aid two-year, four-year, university, and high schools to develop articulation and partnership strategies; and to seek alliances between two-year schools and local businesses and industries. These programs will serve to benefit in the broadest and most fundamental way the colleges and their full population of students, not just those concentrated in technician training programs.

We note that HR 2936 has been rather substantively revised. The statement of actions needed to improve technical education in the U.S. has been greatly refined and now provides description rather than prescription. As we earlier testified, NSF agrees with the intent of this legislation, but we still oppose HR 2936, as revised, because it is not necessary given our existing authority and because of its narrow focus. We have similar problems with H.R. 3606 and oppose that legislation also. We believe our ongoing effort in this area ought to be broadly based along the lines that I have described. Support for narrowly targeted efforts may come at the expense of much broader and equally meritorious programs.

Appendix

Highlights of Current NSF Activities at Two-Year Colleges

A. Two-Year College Education

The Foundation is best able to focus on three areas which affect all parts of the instructional programs in science, engineering, mathematics, and technology -- faculty, curriculum, and laboratories. Programmatically, the Foundation includes two-year colleges as eligible participants in five areas: (1) faculty and teacher enhancement in content areas of science, mathematics, engineering, and technology, (2) curriculum and instructional improvement at college and precollege levels, (3) development of laboratory components of science and engineering programs, (4) young scholars, and (5) private sector partnerships.

Two-year colleges are technically eligible to receive support directly and possibly to benefit in other ways from essentially all NSF programming areas. These colleges are participating in a significant way in EHR's science and engineering programs, which are relevant to their needs, mission, and interests. However, as most NSF funds are in support of basic research, whereas the mission of two-year institutions is purely instructional, two-year colleges receive a relatively small fraction of the total NSF budget. In 1991 two-year colleges received about $3.35 million dollars of support.

At present most of NSF's two-year college support is in the Undergraduate Science, Engineering, and Mathematics Education (USEME) Division and most of the support within that division is in Instrumentation and Laboratory Improvement (ILI). The ILI program provides matching funds for laboratory equipment for college level courses. In FY91 there were a total of 84 NSF grants to two-year colleges, 71 (85%) of which were in Education and Human Resources. Of these 71, 60 were in USEME. 53 of the 84 total grants (63%) were in ILI. It is important to consider however that in addition, 19 grants were awarded to universities and other organizations through Undergraduate Faculty Enhancement (UFE) and Calculus programs totally $1.75 million which also benefit two-year college faculty. Historically, approximately twenty percent of the participants in UFE activities have been two-year college faculty.

In the College Science and Engineering Instrumentation Program (now ILI) eligibility was extended to two-year colleges beginning in FY88. The first year of eligibility yielded 39 two-year college awards totalling $1.2 million dollars. Since that time the program has grown. ILI in FY91 funded 53 two-year college projects totally $1.7 million dollars. The proposal funding rate among two-year schools has grown from 22% of the total proposals received for FY88 to 27% for FY91.

Projects at and for the benefit of two-year colleges have also been supported in other USEME programs, in the EHR precollege improvement programs, and to a limited degree in the research directorates. Some examples of NSF funded projects in two-year colleges follow:

- **Instrumentation and Laboratory Improvement Program**

Harrisburg Area Community College in Pennsylvania is upgrading its CAD laboratory to include a network of computer workstations which support solids modeling and analysis software. Students in the mechanical engineering technology and manufacturing and design technology programs study the concepts and techniques of interactive solids modeling using this equipment.

Owens Technical College in Ohio has established a state-of-the-art Metrology Data Center. This data center enables students in the Quality Engineering Technology program to learn efficient methods of collecting plant process and quality data and to learn to use effective means of turning that mass of data into useful information for manufacturing decision making.

Parkland College in Illinois is developing new methods for teaching the non-traditional student and integrating the computer into its electronic and computer systems technology programs. These work/test stations put the student in control of a multi-media learning environment that is being matched to their learning styles.

Texas State Technical Institute is preparing specialized electronic-electromechanical technicians for the continuous and batch manufacturing industries using specialized laboratory equipment. The intent of the laboratory is to leapfrog the gap between current state-of-the-art training facilities and industrial needs through the integration of an entire control system.

- **Private Sector Partnerships**

Alabama Aviation and Technical College and Northwest Airlines in partnership are developing a program to support the improvement of mathematics education in aviation technology programs. The goals of the project are to strength the mathematics component of the aviation technology programs offered at the school by the design, development, pilot-testing, and revision of three new courses in collaboration with avionics engineers and by exposing students in their avionics programs to the real workplace. Special emphasis in the program is on increasing the opportunities for women and minorities in aviation technical education.

At Lewis and Clark Community College in Illinois the project "Math, Science, and Technology Education for Riverbend in the 90s" aims to enhance math and science education for non-baccalaureate bound students in community college preparatory programs and career programs in grades 6-12. The project will help prepare students for technical careers. Current applications of science and mathematics will be integrated into the curricula.

Harry S. Truman of the City Colleges of Chicago is conducting a project for Biotechnician Training. This project will develop a two-year curriculum leading to an associate degree in technology, prepare students for employment as biotechnicians, and increase the representation of minority and disadvantaged populations in science and math technology. Harry Truman College also has a Young Scholars Program using the topic of Chicago as an ecosystem designed to acquaint inner city youth with the technical systems in the community.

- Undergraduate Faculty Enhancement Program

Prince George's Community College of Largo, Maryland conducted a six day workshop for community college faculty to learn about the Chesapeake Bay ecology at the University of Maryland Chesapeake Bay Biological Laboratory. Lectures, field work, and laboratory work were included.

Texas A&M has designed a model for the utilization of cooperative relationships between university professors and two-year college faculty members to provide professional inservice enrichment training for two-year college physics teachers. The program focuses on recent developments in physics, innovative physics teaching methods, and successful techniques for recruiting local minority students into two-year college science and engineering programs.

- Undergraduate Course and Curriculum Program

Joliet Junior College in Illinois will conduct a one-year pilot program for experienced community college physics teachers. Hands-on workshops are planned to foster the approach of using microcomputer-based laboratories, conceptual exercises, and overview case studies. The main goal of the project is to encourage participant teachers to adapt or develop curriculum approaches which incorporate this knowledge so that students develop a stronger understanding of physics concepts.

- Young Scholars Program

Cuyahoga Community College in Cleveland conducted a project consisting of enrichment activities based on the "Teaching Integrated Math and Science" curriculum, research projects led by university faculty and NASA engineers and scientists, and industrial tours. This program was jointly funded by NSF, NASA, and the Ohio Board of Regents for students in grades 7 and 8. Emphasis was on participation by girls, minorities, and economically disadvantaged.

Northwest College in Wyoming led a program in Yellowstone National Park for students entering Grade 12. Students were exposed to various aquatic field and laboratory research paradigms, designing and choosing appropriate research methodologies as they designed and carried out an environmental study of the Gibbon River. There was an emphasis on participation by Native American students of the Rocky Mountain Region. The study also provided useful data to Yellowstone National Park research offices.

- **Calculus Program**

Union County Community College in New Jersey received a grant to implement a calculator-based calculus curriculum at five community colleges.

Suffolk Community College in New York is part of a consortium of schools including Harvard University, the University of Arizona, Colgate University, Haverford College, and others who are investigating the use of calculators and computers in opening up new topics in and new ways of teaching calculus. Emphasis in the lessons is on the "Rule of Three": when possible calculus topics should be investigated from a numerical, graphical, and algebraic standpoint.

- **Teacher Enhancement**

Blackfeet Community College in Montana is studying new methods for improving mathematics and science education for American Indian students by adapting activities to the Blackfeet culture. This multifaceted program includes community groups, local educators, and students from the community college.

Mr. **Boucher**. Thank you very much, Dr. Williams. We appreciate your attendance here this morning. On behalf of the subcommittee, I will express an apology that we don't have more members with us at the moment. As was stated by one of the other members earlier, there are a number of committees meeting today. Hopefully, this will be the last week of the Congressional session prior to our recess, and everyone is anxious to finish business as rapidly as possible.

However, Mr. Packard and I do have a number of questions of you. I will proceed to propound several of those.

You testified before Mr. Valentine's subcommittee, I think, earlier this fall—I believe it was in the month of September.

Dr. **Williams**. Right.

Mr. **Boucher**. During the course of that testimony, you indicated that the programs advocated by Mr. Price's legislation were well accommodated within existing programs at the National Science Foundation. Yet when we examined the record of the various programs that you cited, we found that those programs are not funded today. That, obviously, gives us some pause.

We also noted that in 1991, the grants from the National Science Foundation to two-year colleges—all of them taken together—totalled only some $3.35 million with half of those funds allocated to instrumentation and to laboratory improvements. The balance covered a range of activities including grants for private sector partnerships, undergraduate faculty enhancement, undergraduate course and curriculum programs, the Young Scholars Program, and teacher enhancement—a fairly small amount of money, I might note, to cover that broad range of initiatives, none of which, by the way, are specifically targeted toward the kinds of goals that Mr. Price has identified in his legislation.

Dr. **Williams**. Right.

Mr. **Boucher**. I suppose that a number of questions flow from that. First of all, let me ask this.

One of the things that Mr. Price suggests would be paramount in his bill is the creation of centers of excellence with the notion that curricula could be developed at particular institutions receiving grants from the NSF and then, through a principle of nucleation, have that successful experience shared with other institutions nationwide.

What do you think of that, and if it is a valuable idea, why is the NSF not doing that today?

Dr. **Williams**. It is a valuable idea. I would like to respond to the general question with respect to level of support. Your recital of what the NSF funded in that sector last year is entirely correct, and it's inadequate.

The proposal for the centers, in my judgment, is excellent, both on educational grounds and from the point of view of being consistent with the way in which the foundation typically does its business. The idea of concentrating in several institutions—call them national centers of excellence—curriculum development with the requisite laboratory development and faculty enhancement as an aggregate—because what one is really trying to do is improve the overall enterprise, not simply instrumentation or faculty as distinct units. Then, as the foundation typically does, to employ the outcomes from those centers as models so you don't tip the Nation, and to have those models rapidly disseminated throughout the country, in my judgment, would be noteworthy.

It would be consistent with the way in which—as I said earlier, the foundation, in an excellent fashion, does its business—and it certainly would be extremely important in terms of dealing with the needs of two-year institutions.

Mr. **Boucher**. Do you have any programs today where, in your requests for proposals, you have language that specifically invites proposals for model programs in advanced technology that would prepare and upgrade technicians?

Dr. **Williams**. No.

Mr. **Boucher**. You don't?

Dr. **Williams**. No.

Mr. **Boucher**. Well, Mr. Price, obviously would require in his legislation that you do that.

Dr. **Williams**. Right.

Mr. **Boucher**. I think you conceded the appropriateness of that model.

Dr. **Williams**. Yes.

Mr. **Boucher**. So if we were to choose to enact that, I would assume you would have no objection.

Dr. **Williams**. None.

Mr. **Boucher**. Address, if you will, the general inadequacy of funding for two-year and community college programs. The level is $3.35 million in an agency that next year will have something approaching $2.7 billion in total funding. Why so small an amount, and what should this subcommittee do to help you provide a better balance in terms of funding for these programs as compared to other things?

Dr. **Williams**. The reference to the agency's total budget, vis-a-vis, the needs of the institutions being addressed by the bills before us, is an excellent framework. Nearly $2.7 billion—of that amount, not an inconsequential amount, to be sure, and a rapidly growing amount—$465 million is devoted to Education and Human Resources, so the $2 million, $3 million, is on the research account.

So within the $465 million, the majority of the resources are devoted to the K - 12 sector, with which I don't disagree. I mean there has been a major focus in the foundation and in the Congress to substantially improve the quality of math and science education in K - 12.

The two-year college program would be supported in the undergraduate component, which is less than $50 million as a direct appropriation to the Education and Human Resources Directorate. So the $3 million to which you referred has its place within roughly a $50 million window. So it is that component of the overall budget of the foundation that would require attention.

Mr. **Boucher**. Let me ask you what I think the bottom line question will be for most of the Members here. If we were to enact Mr. Price's proposal or some modification of it — and by the way, we would welcome your participation in talking about appropriate modifications—but if we were to enact that proposal or some appropriate modification of it and ensure, in the process of doing that, that the new initiative did not impinge on existing NSF programs, would the NSF object to our doing that?

Dr. Williams. No, the NSF would not object.

Mr. Boucher. All right; that's fine. Thank you, Dr. Williams.

I will recognize the gentleman from California.

Mr. Packard. Thank you, Mr. Chairman.

What are the goals for the next 10 years of the NSF in terms of strengthening the technology development of our community colleges?

Dr. Williams. To substantially upgrade the faculty that participates in those institutions. That's a very real problem in terms of currency for reasons that are self-evident.

In concert with that, to ensure that we really have contemporary, substantial, and appropriate curricula—in order to do so, as was pointed out by one of your colleagues, that requires consultation with the industrial sector, input into that process. To design those curricula so that they are sufficiently elastic so that you can continue to upgrade them in time so that they are, in the case of robotics, in the case of fabrication, in the case of advanced manufacturing, appropriate.

Third is to promote substantial articulation between two sectors: high schools and two-year institutions. We can do that, I think, better now because of the major investment in the K-12 sector which has a 5 to 10-year time frame. Second, to promote articulation—that is, to prepare the students appropriately in terms of courses, in terms of counseling, such that students who desire to move from the two-year to the four-year institution—for the foundation to do that as a model, as we often do programs, we would probably have to have several classes, and that takes an eight or nine-year time frame.

The idea, essentially, over the next 10 years, from the point of view of undergirding math and science education that leads to specific technical education, is for the foundation to become a major player in revitalizing and rendered appropriate in terms of quality of training of two-year institutions. We need to do that, not only from the point of view of technical education. We need to do that really in order to have a constant stream of production of quality bachelor's degree recipients, because as we all know, a significant number of students, almost 50 percent of students who are interested in science, math, and technology, actually are enrolling in associate degree programs.

So the goal is: within a 10-year time frame, to the extent to which its resources permit, to essentially support the overhaul of that sector, but not in isolation. I want to emphasize. The articulation component is very important to make sure that youngsters who complete or workers who complete the two-year college sequence, the associate degree sequence, are appropriately prepared for the work force, or if they like, to then complete their bachelor's degrees.

Mr. Packard. In the opening portion of your statement, you indicated that you don't support the legislation because it's unnecessary. I interpret that to mean that you either do not subscribe to the provisions of the bill or you intend to accomplish that without the bill; that NSF would move forward with the objectives and goals of the bill—

Dr. **Williams**. If the resources were available.

Mr. **Packard**.—without having the mandate of this legislation.

Dr. **Williams**. That's right.

Mr. **Packard**. I presume it's the latter of the two.

Dr. **Williams**. That's right.

Mr. **Packard**. Has NSF given serious consideration to the programs outlined in the legislation—

Dr. **Williams**. Yes, indeed.

Mr. **Packard**.—in terms of moving forward in spite of or without the legislation?

Dr. **Williams**. As I answered the Chairman, I agree with them. We have very carefully gone through all of the programs that are detailed in the bill, in particular all the centers. That's a very effective way to deal with the broad needs in the associate degree programs in exactly the way NSF does it.

Mr. **Packard**. Does your budget accommodate those goals?

Dr. **Williams**. No.

Mr. **Packard**. With that, what are the plans of NSF then if funds do not come forth? What are your alternative goals and approaches?

Dr. **Williams**. Well, the alternative scenario—and it would not clearly achieve 10 centers, but to be honest, we regard, even in the study stage budget situation, we regard the problem in the two-year college sector as sufficiently important that increased resources, even within the $50 million, are going to move to the two-year college sector.

Mr. **Packard**. Do you have that flexibility of budgeting within your own agency, or does that have to be earmarked monies from—

Dr. **Williams**. No, we can do it from our agency. The critical issue is the level of funds.

Obviously, if you desire 10 centers—and I agree with that—we would not be able to achieve that within our present budget, but some number, yes.

Mr. **Packard**. If in fact it's done in house then in terms of the budgeting, then it becomes a process of priority, really.

Dr. **Williams**. That's right.

Mr. **Packard**. I guess that would be my last question, Mr. Chairman.

How do the goals and objectives of this program fit into the priorities of NSF overall?

Dr. **Williams**. At the undergraduate level in the instance of math, science, engineering, and technology education, the match is almost total. We made a deliberate decision that the component of the total undergraduate enterprise on which we should focus, to which we should assign primacy, are the first two years.

So that is the total sequence if you are talking about an associate degree program, and it is the first two years if you're talking about a four-year institution. That's the target of substantive attention. That's the highest priority. And, quite frankly, that's where the largest problem lies.

Mr. **Packard**. Thank you, Mr. Chairman.

Mr. **Boucher**. The Chair thanks the gentleman.

Dr. Williams, as we continue to review this proposal, we probably will have some additional questions. We will talk with you informally and will perhaps, for this record, submit some questions in writing. We would appreciate your cooperation in that.

Dr. **Williams**. I'll be pleased to respond.

Mr. **Boucher**. Thank you very much for your very helpful testimony today. There being no further questions from the subcommittee, with our thanks, you are excused.

Dr. **Williams**. Thank you.

Mr. **Boucher**. We now welcome our third and final panel of witnesses for the morning: Dr. William Snyder, the President of Wytheville Community College in Wytheville, Virginia; Mr. Jeff Ellison, the Existing Base Manager for INTEL in Chandler, Arizona; Dr. Cary Israel, the Director of the Illinois Community College Board from Springfield, Illinois; Mr. P. Douglas Groseclose, who is replacing Mr. Tony Marty. Mr. Groseclose is the Director of Staffing, Organization, and Employee Development for Martin Marietta Electronics, Information and Missiles Group, from Orlando, Florida; and Dr. Paul Gianini, Jr., President of Valencia Community College in Orlando, Florida, who is also Chairman of the Joint Commission on Federal Relations of the American Association of Community Colleges and the Association of Community College Trustees.

Without objection, the prepared written statements of all of our witnesses will be made a part of the record. We will begin our testimony this morning starting at our far left with Mr. Ellison.

We will be pleased to hear from you, Mr. Ellison, and the Chair would ask that each of the witnesses please confine the oral statements to five minutes so that we will have plenty of opportunity for questions.

STATEMENT OF JEFF ELLISON, EXISTING BASE MANAGER, INTEL, CHANDLER, ARIZONA

Mr. **Ellison**. Thank you.

The strategic advanced technology need: One of the critical elements for the U.S. Semiconductor market to perform competitively is a competitive work force. Our educational system in the U.S. today provides advanced degree professionals like engineers and high school basic education operators, but has no output to provide manufacturing technologists. Manufacturing technologists must be skilled in manufacturing, equipment, and process technologies.

Individual companies have attempted to address this need with their local community colleges with limited success. The economics of developing the faculty, curricula, and facilities for advanced technology training is very unattractive to two-year degree colleges unless a wide technology base is leveraged to provide the college with an acceptable return on investment.

Capabilities required to fill the need: For academia to fulfill the need, several capabilities will have to be put in place. First, the faculty must be trained by industry experts so that the product they produce fulfills the need of the customer industry. Secondly, applicable courses and curricula must be available. Finally, the appropriate facilities and equipment must be available. Each of these capabilities will necessitate external funding for the particular community college to implement these high-technology programs.

Training faculty can best be accomplished by interaction with the customer to whom the product will be delivered, industry. Seminars by advanced technology experts on the manufacturing process, techniques, methodologies, et cetera, and plant tours give the faculty insight into the environment their students will be expected to perform in and how they will be expected to perform. Training the trainer classes by industry experts serve as interactive sessions to refine the courses and give industry-specific examples and applications of course material.

Finally, industry projects performed by the faculty give the staff firsthand insight into the interactions and boundary conditions not easily picked up without personal involvement. Applicable courses and curricula must be developed at each institution.

The fundamentals for this have been the focus of the Department of Education's Cooperative Demonstration Program High Technology Grants for some time, and significant progress has been made, i.e., SemiTOP. However, the specific courses and curricula must be customized and internalized by each institution and/or locality to meet the needs of the customers.

From the advanced technology manufacturing point of view, here are a few of the appropriate courses to be included: sources of variation, characterization techniques, statistical process control, total productive maintenance, cost of ownership, and basic course with examples and applications based on advanced technology manufacturing.

For faculty teaching advanced technology courses and curricula to be effective, the appropriate facilities and equipment must be available. Training technologists on manufacturing, maintenance, and process technologies requires manufacturing tests and analytical equipment and facilities like clean rooms capable of emulating the requirements of the industry environment. This equipment can be acquired through industry donations, equipment supplier donations, or direct purchases. Maintaining this equipment will become a primary responsibility of the students and faculty, although installation and start-up will be an initial expense requiring external funding.

Management of the elements for results—and this is the key point, I think, in my testimony. The management of this program must have a strategic vision of accomplishing the result as opposed to the individual elements.

Each of the elements, trained faculty, applicable courses and curricula, and facilities and equipment must be managed for success. However, the strategic selection of the activities and priorities of this program must be managed to deliver all the necessary elements in the right proportions, order, and quality to achieve the end result.

The result must match the need of the customer. Therefore, the management of this activity must constantly interact with its customer, U.S. advanced technology manufacturing.

Finally, successful management of this program requires effective utilization of resources. Dissemination of the results to all the participants and coordination of activities to eliminate duplication or waste of effort must be monitored and minimized.

For the big picture, providing education needs for U.S. industry, primary, secondary, two-year degree and four-year degree institutions, must be integrated into the system of synergistic activities. Outreach programs and affiliations are presently unmanaged from a national perspective.

The management of this and other educational bills provides a unique opportunity to coordinate, integrate, and synergize the educational system to maximize output, quality, and efficiency. The end result must be to provide U.S. industry with a competent and capable work force, quickly, efficiently, and of world-class quality.

[The prepared statement of Mr. Ellison follows:]

SCIENCE AND TECHNOLOGY EDUCATION IN TWO-YEAR DEGREE COLLEGES

INTRODUCTION:

My name is Jeff Ellison. I work for Intel Corporation as the Existing Base Manager for Process Equipment Development (PED). I have been in the semiconductor industry for ~13 years, primarily in manufacturing, but the last 4 years have been in corporate engineering management. I recently completed my first participation in a Department of Education's Cooperative Demonstration Program High Technology Grant as a technical consultant for a two-year degree curricula development program in semiconductor manufacturing "Super Operators" (SemiTOP).

STRATEGIC ADVANCED TECHNOLOGY NEED:

One of the critical elements for the U.S. Semiconductor market to perform competitively in the world marketplace is a competent work force. Our educational system provides advanced degree professionals (engineers) and high school basic education (operators) but has no output to provide "manufacturing technologists." These so called "manufacturing technologists" must be skilled in manufacturing, equipment and process technologies.

Individual companies have attempted to address this need with their local community colleges with limited success. The economics of developing the faculty, curricula and facilities for advanced technology training is very unattractive to two-year colleges unless a wide technology base is leveraged to provide the college with an acceptable return on investment (ROI). Developmental funding for this capability can deliver a self-sustaining technology education system which would fill a strategic need.

CAPABILITIES REQUIRED TO FILL THE NEED:

For academia to fulfill the need, several capabilities will have to be put in place. First the faculty must be trained by industry experts so the product they produce fulfills the need of the customer; industry. Secondly, applicable courses and curricula must be available. And finally, the appropriate facilities and equipment suitable for advanced technology manufacturing training must be available. Each of these capabilities will necessitate external funding for the particular community college to implement these high technology programs.

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Training faculty can best be accomplished by interaction with the customer to whom their product will be delivered; industry. Seminars by advanced technology industry experts on the manufacturing process, techniques, methodologies, etc., and plant tours give the faculty insight into the environment their students will be expected to perform in and how they will be expected to perform. Train-the-trainer classes by industry experts serve as interactive sessions to refine the courses and give industry specific examples and applications of course material. Finally, industry projects performed by the faculty give the staff first hand insight into the interactions and boundary conditions not easily picked up without personal involvement. Applicable courses and curricula must be developed at each institution. The fundamentals for this have been the focus of the Department of Education's Cooperative Demonstration Program High Technology Grants for some time and significant progress has been made (i.e., SemiTOP, etc.). However, the specific courses and curricula must be customized and internalized by each institution and/or locality to meet the needs of their customers. From the advanced technology manufacturing point of view, here are a few of the appropriate courses to be included:

- Systematic and random sources of variation in processes
- Characterization techniques (Design of Experiments (DOE), Response Surface Methodology (RSM), etc.)
- Statistical Process Control (SPC)
- Total Productive Maintenance (TPM)
- Cost Of Ownership (COO)
- Total Quality Management (TQM)
- Basic courses (math, physics, chemistry, statistics, english, psychology, etc.) with examples and applications based on advanced technology manufacturing.

For faculty teaching advanced technology courses/curricula to be effective, the appropriate facilities and equipment must be available. Training technologists on manufacturing, maintenance and process technologies requires manufacturing, test and analytical equipment and facilities (i.e., "clean room") capable of emulating the requirements of the industrial environment. This equipment can be acquired through industry donations, equipment manufacturer supplier donations and/or direct purchases. Maintaining this equipment will become a primary responsibility of the students and faculty, although installation and start-up will be an initial expense requiring external funding.

MANAGEMENT OF THE ELEMENTS FOR RESULTS:

The management of this program must have a strategic vision of accomplishing the result as opposed to success of the individual elements. Each of the elements; trained faculty, applicable course and curricula, and facilities and equipment suitable for advanced technology manufacturing training, must be managed for success. However, strategic selection of the activities and priorities of the program must be managed to deliver all the necessary elements in the right proportions, order and quality to achieve the end result. The result must match the need of the customer. Therefore, the management of this activity must constantly interact with its customer; U.S. advanced technology manufacturing. Finally, successful management of this program requires effective utilization of the resources. Dissemination of the results to all participants and coordination of activities to eliminate duplication or waste of effort must be monitored and minimized.

For the "big picture" of providing the educational needs for the U.S., primary, secondary, two-year degree and four-year degree institutions must be integrated into a system of synergistic activities. Outreach programs and affiliations are presently unmanaged from a national prospective. The management of this and other educational bills provides a unique opportunity to coordinate, integrate and synergize the educational system to maximize output, quality and efficiency. The end result must be to provide the U.S. industry with a competent and capable work force; quickly, efficiently and of world class quality.

H.R. 2936 and H.R. 3606's Ability to Address these Needs

1) Do the provisions in the bills address the most critical shortcomings in science and technology education in two-year colleges?

*** These bills address funding solutions for the critical shortcomings of science and technology education in two-year colleges.**

2) Are the provisions in the bills adequate for achieving their objectives?

*** The success of these bills, in achieving the stated adjective, will depend on the program management and the strategic vision and follow-through to achieve the result, not just the process.**

3) Is NSF the proper agency to administer these grant programs?

*** I am not well enough informed of all the governmental bodies nor their charters to determine who is best suited for the management of these programs. Regardless of what agency manages the program, a major portion of that job is to facilitate the interaction between industry and the educational institution to define the need (skills) to be provided.**

4) What is currently being done to assist local economic development through instruction administered by two-year colleges?

*** Individual companies have taken it upon itself to contact local two-year degree colleges to tailor education programs to their needs. These efforts are usually not highly leveraged, since they represent only one company, and they are difficult to support from the colleges perspective. At best, we have isolated islands of local success in this area.**

5) From a national perspective, what additional services should be performed by these institutions?

*** From a national standpoint, these institutions should accelerate their activities in the following areas;**
- Geographical, financial and technical analysis of opportunity
- Industrial projects
- Industry analysis, future and historical

6) What is the current status of partnership agreements between the two-year institutions, their local secondary schools, and four-year institutions?

*** Outreach programs between secondary, two-year and four-year degree institutions appear to be unmanaged from a U.S. perspective. With the best intentions from the individual institutions, no national strategic plan is evident nor accomplished. National management of these efforts is required to accomplish results rather than another process.**

SemiTOP

Semiconductor Technology Operator Program

Project Staff

Administrative:

Jim Burnett, Director
Tina Weber, Secretary
Kelly Harris, Lab Coordinator

Instructors:

Ray Culver, Physics
George Kocher, Chemistry
Jack Davis, Computers
Otis Shouse, Statistics

Technical Consultants:

Jeff Ellison, Intel Corporation
Steve Sprouse, Intel Corporation

Funded:

U.S. Dept. of Education
Grant No. V199A00081

An Introduction to SemiTOP

SemiTOP

Semiconductor Technology Operator Program

LOCATED AT OLNEY CENTRAL COLLEGE

IN ASSOCIATION WITH IECC District 529, GOVERNMENT & INDUSTRY

"Opportunity with Excellence"

PROJECT FUNDING

Illinois Eastern Community Colleges(IECC) District 529 is currently developing a program in semiconductor manufacturing technology.This curriculum development process is funded by a grant from the U. S. Department of Education's Cooperative Demonstration Program with matching funds from IECC and equipment donations from the Intel Corporation.

SemiTOP

ADVISORY COMMITTEE

I. Adesida -
Associate Director for Education, Center for Compound Semiconductor Microelectronics
University of Illinois

R. Carnes -
Yield Enhancement/Production Line Manager
Motorola Inc.

J. Coleman -
Professor, Department of Electrical and Computer Engineering, University of Illinois

R. Culver -
Physics Instructor, IECC

J. Davis -
Director of District Computer System, IECC

B. Effland -
Electronics Technology Instructor, IECC

J. Ellison -
Existing Base Manager Process Equipment Development, Intel Corporation

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65 6C

ADVISORY COMMITTEE

L. Fuller -
Director of Microelectronic Engineering,
Rochester Institute of Technology
M. Hallam -
Personnel Manager, CAC Microcircuits Inc.
T. Harned -
Electronics Technology Instructor, IECC
G. Kocher -
Industrial Technology Instructor, IECC
K. Peak -
Director of Research and Information System, IECC
O.D. Shouse -
Math Instructor, IECC
S. Sprouse -
Program Manager, CPE/FA, Intel Corp.
G. Woods -
Director of Industrial Technology, IECC

----- The SemiTOP Objective ------

A MODERNIZED SEMICONDUCTOR LAB ENVIRONMENT

-- for --

TRAINING STUDENTS

-- to --

OPERATE & MAINTAIN MANUFACTURING TECHNOLOGY

"Opportunity with Excellence"

An Introduction to SemiTOP

SemiTOP

----- SemiTOP Program Features -----

PROGRAM RECRUITMENT ---- state-wide and regional

TECHNOLOGY TRANSFER ---- facilitated by equipment donations

INTEGRATED EFFORT ---- including education and training

PLACEMENT ---- through contact with Microelectronic Industry

"Opportunity with Excellence"

Job Description
Operational Specialist

Responsibilities include set-up, operations, productive maintenance and statistical process control of semiconductor process equipment. Work with engineering to improve processes and reduce cycle time and improve yields. Capable of inspecting and disposing work in progress.

Must be a "team" player with good communication skills; requiring minimal supervision and the ability and aptitude to learn new skills.

Working environment includes wearing cleanroom attire and safety garments as required while operating equipment which may use hazardous chemicals and gases.

"Opportunity with Excellence"

Job Availability

Estimated Demand
American Semiconductor Waferfabs*

	Non-adjusted*	Adjusted
● Engineering	551.25	358
● Technicians	1,134.00	794
● Operators	8,662.50	8,229

*The estimated demand in the "non-adjusted" column represents an estimate of the total demand and includes vacancies created by promotion, relocation, or change of industry, as well as new hires. The column on the right has been adjusted to reflect only "new hires" who would require college or other special training.

JOB AVAILABILITY

Table 1
Personnel Staffing of American Semiconductor Waferfabs
(Average Staffing per Plant)

	Average	% Turnover	No. of Turnovers
● Engineering	50	3.5%	1.75
● Technicians	36	10.0%	3.60
● Operators	110	25.0%	27.50

Assuming 315 Fabrication Plants with an average turnover as noted above, the current demand is estimated as follows:

Admission Criteria

- - - - - Minimum Entry Level - scores on the ASSET will be:

- 14 - Reading- - - - - - - - - - - - - - - possible 24
- 22 - Language Usage - - - - - - - - possible 36
- 13 - Numerical Skills - - - - - - - - possible 32

- - - - - MPE Test Score (Level 2) equal to 15 or greater will be accepted.

- - - - - High School transcripts should indicate students ability and motivation to learn and success in high school Math. (Minimum of a C in high school algebra)

ASSET Test

ASSET is an assessment-advising program designed to identify the basic skill levels of students as they enter two-year institutions. The primary goal of this assessment process is to efficiently gather information about individual student's skills, needs, and plans, as an important step in the process of assisting the students in developing and implementing a sound program of study that leads to these goals.

The scores for the ASSET test are evaluated as follows:

Reading - possible 24, a score below 14 means remediation
Language Usage - possible 36, below 22 means remediation
Numerical Skills - possible 32, below 13 means remediation

SemiTOP

Math Placement Exam

The Mathematics Placement Examination, MPE, was developed as a means of identifying postsecondary students' mathematical skills and abilities related to specific mathematics courses. The intended use of the scores is to place college students into mathematics courses appropriate for their mathematics knowledge and skill level. Level 2 of the MPE covers intermediate algebra and geometry.

MPE Level 2 is evaluated as follows

0-12	Beginning Algebra REM-0421
13-14	Decision Zone (At least 12 on Ele. Alg. to go to MTH-1101)
15-16	Intermediate Algebra MTH-1101
17-18	Decision Zone (At least 16 on Int. Alg. to go to MTH-1101 or take Level 3 test)
19	College Algebra MTH-1102 or Finite Math MTH-1151

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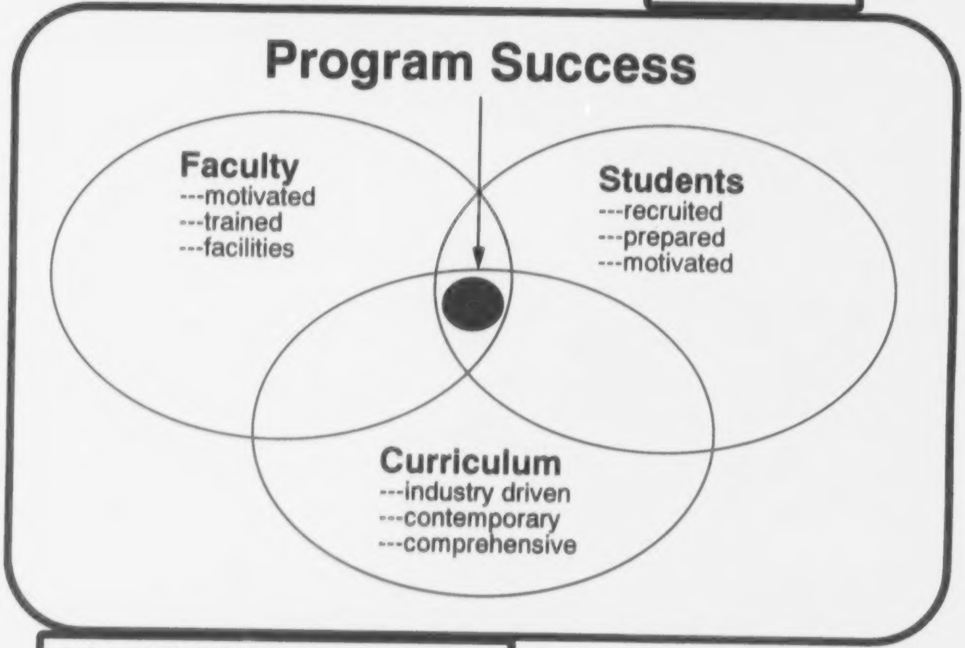
Program Success



Faculty
---motivated
---trained
---facilities

Students
---recruited
---prepared
---motivated

Curriculum
---industry driven
---contemporary
---comprehensive

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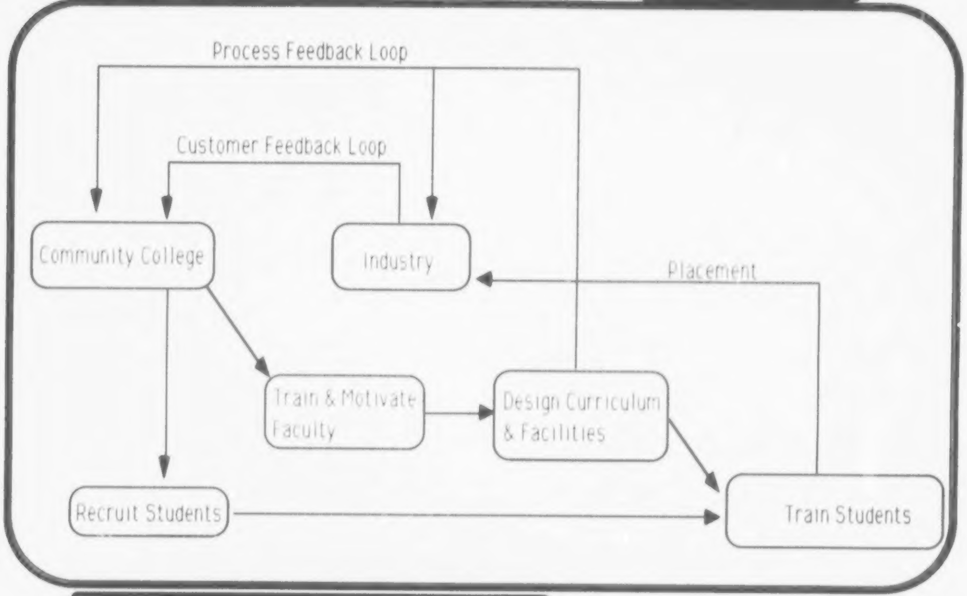

Process Feedback Loop

Customer Feedback Loop

Community College

Industry

Placement

Train & Motivate Faculty

Design Curriculum & Facilities

Recruit Students

Train Students

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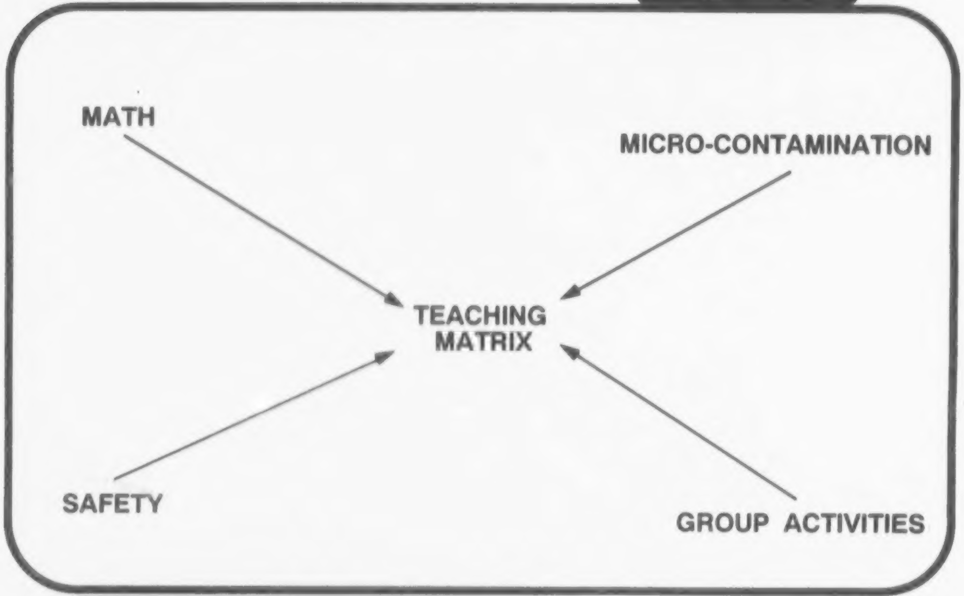
An Introduction to SemiTOP

SemiTOP



MATH

MICRO-CONTAMINATION

TEACHING MATRIX

SAFETY

GROUP ACTIVITIES

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Math Across the Curriculum

OBJECTIVE: (Math Matrix)

Students will recognize and use Math as a Language.

Design:

A matrix will obtain complete coverage of mathematics as it applies to introductory courses in Physics, Chemistry, Computer Science and Statistics.

Allows for determination of inter-relationships (or lack of) between the language (*mathematics*) of Physics, Chemistry, Computer Science and Statistics.

A matrix contains "hidden" replication to reinforce learning of math as a language of science.

MATH SKILLS

- Basic Arithmetic
- Use of Calculator
- Order of Operation
- Scientific Notation
- Measurements
- Significant Figures
- Algebraic Operations
- Algebraic Expressions
- Solving Equations
- Ratios & Proportions
- Approximation
- Powers & Roots
- Signed Numbers
- Right Triangle Trigonometry
- Rectangular Coordinates
- Polar Coordinates
- Vectors
- Slopes of Lines
- Independent & Dependent Variables
- Graphing Techniques
- Graphical Analysis
- Quadratic Equations
- Trigonometric Ratios
- Logarithms
- Problem-Solving
- Basic Geometry
- Distribution Characteristics:
- Normal Distribution
- Standard Deviation
- Frequency Distribution
- Sample Average
- Experimental Error
- Inferential Statistics
- Descriptive Statistics
- Significance Tests
- Confidence Intervals
- Analysis of Variance
- Factorial Analysis

Safety Across the Curriculum

OBJECTIVE:

Students and Faculty will develop a safety oriented attitude!

Design:

A safety oriented attitude combined with training and discipline will reduce injuries and loss of equipment and property.

Focus is always on the person before materials and/or facilities.

Safety is a concern not only in our work but also in our personal lives.

SemiTOP

Micro-Contamination Across the Curriculum

OBJECTIVE:

Students and Faculty will develop the skills associated with working in a cleanroom environment.

DESIGN:

Integrated Circuits are manufactured in a highly controlled environment.

Cleanroom procedures will include specifications, monitoring instruments, air filtering systems, clothing and dressing.

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Group Activities Across the Curriculum

OBJECTIVE:

Training of mature, able, motivated, and autonomous workers!

Design:

Human resources development combined with technical education.

Students will develop the motivation and ability to accomplish team goals.

Motivation increases as we learn the importance of each individual.

An Introduction to SemiTOP

SemiTOP

The following is the curriculum outline for the two-year Semiconductor Technology Operator Program

Year 1		Year 2	
Semester 1		**Semester 1**	
Semiconductor Tech I	3 hrs	Vacuum Technology	3 hrs
Physics I	5 hrs	Industrial Electronics	4 hrs
Chemistry I	5 hrs	Schematics/Blueprints	3 hrs
Computer Science I	2 hrs	Metrology	2 hrs
Composition	3 hrs	Wafer Inspection	2 hrs
	18 hrs	Economics	3 hrs
			17 hrs
Semester 2		**Semester 2**	
Semiconductor Tech II	3 hrs	Wafer Processing Lab	8 hrs
Physics II	5 hrs	Process/Equipment Tech.	3 hrs
Chemistry II	5 hrs	Electronic Systems Servicing	4 hrs
Statistics	3 hrs	T. Productive Maintenance	2 hrs
PSY Human Relations	2 hrs		17 hrs
	18 hrs	Total hours	70

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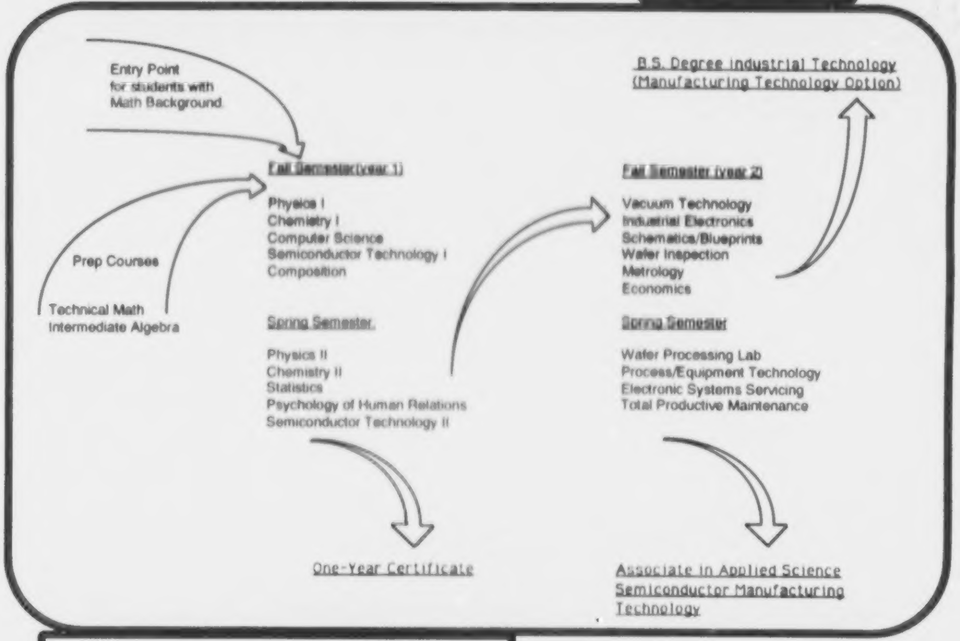
An Introduction to SemiTOP

SemiTOP



Entry Point
for students with
Math Background

Prep Courses

Technical Math
Intermediate Algebra

Fall Semester (year 1)

Physics I
Chemistry I
Computer Science
Semiconductor Technology I
Composition

Spring Semester

Physics II
Chemistry II
Statistics
Psychology of Human Relations
Semiconductor Technology II

One-Year Certificate

Fall Semester (year 2)

Vacuum Technology
Industrial Electronics
Schematics/Blueprints
Wafer Inspection
Metrology
Economics

Spring Semester

Wafer Processing Lab
Process/Equipment Technology
Electronic Systems Servicing
Total Productive Maintenance

Associate in Applied Science
Semiconductor Manufacturing
Technology

B.S. Degree Industrial Technology
(Manufacturing Technology Option)

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An Introduction to SemiTOP

SemiTOP

Semiconductor Technology I

This course is an introduction to integrated circuit manufacturing. Topics include device features such as junctions, gates, interconnects and bond pads. Students will also be introduced to various process areas including diffusion, lithography, etch, thin films, implant, and metrology.

Semiconductor Technology II

This course is designed to introduce students to Integrated Circuit Manufacturing from a historical perspective to the current industry worldwide. Topics will include manufacturing models, life cycles for integrated circuits, and the roles and responsibilities of IC manufacturing personnel. Students will also learn statistical process control and how to apply these methods to process development and quality control.

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Composition I

Composition I is an introductory course in composition and rhetoric emphasizing expository prose. Major focus is on organization, paragraph structure and elimination of mechanical errors.

Statistics

Students will be introduced to Probability Basic Stat (mean, variant and standard deviation), Comparative test (N-test, T-test), Experimental Designs (Fractional Factorials, Orthogonal Arrays), ANOVA, and Statistical Process Control

Computer Science I

This course is an introduction to computers and their applications. Topics include computers and their capabilities, computer equipment, and software. The educational, social, and vocational aspects and impact of computers will be discussed. Included applications will be spread sheets, word processing and graphics. The objective is to train students to use computers for data representation and analysis.

Chemistry I

This course introduces evidence for the components of the atom and an in-depth study of modern atomic theory based on atomic spectra. Other topics include the chemical bond, stoichiometry, changes of state, solutions, and redox. Prerequisite: high school chemistry, or CHM-111, or CHM-1120, or three years of high school mathematics of college algebra or consent of the instructor.

Chemistry II

This course includes chemical kinetics, equilibria, acid-base concepts thermodynamics, electrochemistry, and nuclear chemistry. The descriptive chemistry of each family is covered together with a discussion of the transition elements. The course concludes with a study of organic chemistry.

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Physics I

This course is the first of a two-semester sequence structured for students in pre-professional curricula. It covers the principles of mechanics and heat. Topics include the study of motion, Newton's laws, work and energy, momentum, gravitation, temperature and heat, and oscillatory motion. Prerequisite: MTH-1105 or consent of instructor.

Physics II

The first part of this course covers the principles of electricity and magnetism. The latter part of the semester includes wave motion and sound and concludes with a study of geometrical and physical optics. Prerequisite: PHY-1120 or consent of instructor.

Psychology of Human Relations

Human relations, including group behavior and problems associated with leadership and interpersonal cooperation, are studied.

Economics

The American system of economics is introduced. Subject matter includes an introduction to the sectors of the American economy, business, households, government, the theory of supply and demand, national income accounts, the business cycle, inflation, unemployment, Keynesian theory, and the federal reserve system and uses of money. Attention will be given to application and illustration of theory to current problems.

Vacuum Technology

Students will be introduced to basic vacuum technology as applied to the wafer processing industry. Topics will include an overview of various types of vacuum pumps, seals, gauges, valves, power supplies, and leak detecting equipment.

Metrology

This course will introduce basic concepts of measurement and explain how this knowledge is used to evaluate and improve the adequacy of measurements. This course will give students the skills for measurement of critical dimensions, film thickness and film characteristics such as resistivity, stoichiometry, uniformity and conformity. Students will review equipment used for measuring film properties and process output properties. Calibration techniques and methods for determining and reducing variation will be discussed.

Wafer Inspection

This course is designed to teach students the basic procedures for wafer inspection and to familiarize students with typical defects generated during wafer processing. Students will be exposed to wafer handling techniques, inspection techniques, sampling and defect analysis. Students will be able to identify defects and explain how they occur and develop skills to identify source.

SemiTOP

Industrial Electronics

This is a study of electronics applied to industrial control mechanisms and advanced circuitry. It includes control and switching devices, transducers, relays, PLC's, industrial telemetry, and data transmission techniques. Students receive hands-on experience with selected electronic components and devices in industry, including motors (AC and DC), operational amplifier applications, and microprocessors.

Electronic Systems Servicing

This course provides an analysis of troubleshooting procedures for electronic devices and systems. Component testing, repair methods, and test equipment utilization are covered

Schematics/Blueprints

This course has a special emphasis on schematics and blueprint reading as used in electrical systems. Lab time is spent on developing knowledge and skills in this area.

"Opportunity with Excellence"

SemiTOP

Wafer Processing Lab

This hands-on lab will give students the opportunity to **start-up**, operate and maintain wafer processing equipment, experience wafer handling, and use techniques to optimize a process/equipment output. Students will be introduced to safety and cleanroom procedures.

Process Equipment Technology

Students will review methods to optimize a process/equipment system performance. Topics will include Screening experiments, 2_2 and 2_3 Factorial Designs, and Response Surface Methodology. Students will apply these techniques in the wafer processing lab to optimize process/equipment output.

Total Productive Maintenance

The students will be introduced to the philosophy and development procedures for total productive maintenance. Topics include optimizing equipment effectiveness, eliminating breakdowns, equipment life cycle cost and autonomous operator maintenance. This course is designed for students entering technical fields involving automated manufacturing.

"Opportunity with Excellence"

Mr. BOUCHER. Thank you very much, Mr. Ellison. We will reserve questions of you and the other panelists until all of the witnesses have made their statements.

Mr. Groseclose?

STATEMENT OF P. DOUGLAS GROSECLOSE, DIRECTOR OF STAFFING, ORGANIZATION, AND EMPLOYEE DEVELOPMENT, MARTIN MARIETTA ELECTRONICS, INFORMATION AND MISSILES GROUP, ORLANDO, FLORIDA

Mr. GROSECLOSE. Mr. Chairman and members of the subcommittee, it's a pleasure to appear before you today to address a subject of vital importance to myself, to Martin Marietta, and to the Nation—technology preparedness. Specifically, I will focus on how industry, government, and education partnerships impact our technology preparedness and how we believe the pending legislation may address the challenges of the next decade.

In Central Florida, we have been part of a pioneering journey in partnerships with education. Our training partnership with Valencia Community College has provided a continuing opportunity for resource maximization.

Martin Marietta employees, from shop floor to executive office, benefit from and contribute to this partnership. Our employees serve on advisory committees at Valencia to help identify needs and develop courses.

Martin Marietta employees teach Valencia students and attend classes taught by Valencia faculty. We exchange classroom and lab space and jointly use equipment. Co-op students from Valencia gain invaluable experience while infusing fresh ideas into our workplace.

Valencia has been a key factor in our transition to a computerized work environment. A Federal grant has assisted in training over 1,000 employees in the computer skills they need to manage a paperless manufacturing center. This example, I believe, provides the context within this legislation that can effectively contribute to the reeducation of the American work force.

Reeducating the work force is a critical issue due to the blinding speed of technological change. Statistics from the Department of Commerce tell us that in the years from 5000 B.C. to 1970, humanity reached technology innovation level X. Between 1970 and 1985, the technological innovation doubled. It will redouble by the year 2000 and redouble again by 2015.

Those numbers alone are staggering, yet simple math provides us with the realization that technologically we are moving today at 950-plus pre-1970 equivalent years per year. In the next decade, that will accelerate to nearly 1900 pre- 1970 equivalent years per year. As an example: between the time we awoke and the time we will fall asleep today, technology will travel two and one half years further into the future.

In Martin Marietta's Central Florida operations, the traditional factory worker comprised 42 percent of our total work force in 1981. Today, they comprise 24 percent. This shift from traditional factory worker to knowledge-based worker is occurring across America.

Paralleling this shift, the employers' expectations of factory workers are changing. Five years ago, our assembly workers were trained in basic skills, certified in some specialty skills, and then began working under traditional supervision. Today, we expect those same people to effectively utilize their electronic work station, understand and apply complex statistical tools and processes, make timely and accurate decisions about their work, and work together in teams.

This shift in job expectations is having a monumental impact on how training is conceived, developed, and delivered. Clearly, this shift in what is needed from and demanded from our work force is not unique to Martin Marietta or Central Florida. Just as clearly, our business organizations cannot undertake this monumental reeducation task alone.

The focus of this legislation on partnerships is a fulcrum upon which this shift can be leveraged. The more than 1,200 community, technical, and junior colleges across the country, in partnership with government and industry, can be the driving force in this work force education.

Additionally, business, education, and government partnerships will create the primary pipeline for technology transfer. For example, when Martin Marietta began full-scale production on the LANTIRN contract, a night navigation and automatic targeting system for advanced fighter aircraft, included was the introduction of surface-mount technology, a then new technology in the manufacture of printed circuit boards.

We have worked in conjunction with Valencia Community College to develop expertise in that technology that not only helped to make the LANTIRN system the success it was in Operation Desert Storm, but also provides a strategic advantage to our corporation. Last week, I toured Valencia's nearly completed surface-mount lab where they will now begin transferring this technology throughout the Central Florida industrial community.

In order for manufacturing organizations to regain global dominance, they must invest in new technologies and all the peripherals that accompany the development of new technologies. As manufacturers invest in new equipment, tools, and software to support this global competition, the Federal, State, and local governments should also invest by providing the best possible conditions for the education and retraining of the work force. Programs and partnerships, such as those provided by H.R. 2936 and H.R. 3606, will play a key role in determining the Nation's future.

[The prepared statement of Mr. Groseclose follows:]

Testimony

on

The Technical Education and Training Act of 1991 (H.R. 2936)

and

The National Community College Technology Act (H.R. 3606)

P. Douglas Groseclose

Director, Staffing, Organization & Employee Development

Martin Marietta Electronics, Information & Missiles Group

Orlando, Florida

before the

Subcommittee on Science

Committee on Science, Space and Technology

United States House of Representatives

November 19, 1991

Mr. Chairman and members of the subcommittee, I am P. Douglas Groseclose, director of Staffing, Organization & Employee Development at Martin Marietta Electronics, Information & Missiles Group, which employs more than 10,000 in Central Florida.

It is a pleasure to appear before you today and address a subject of vital importance to myself, to Martin Marietta, and to the nation -- technology preparedness. Specifically I will focus on how industry, government, and education partnerships impact our technology preparedness and how we believe the pending legislation may address the challenges of the next decade.

The Martin Marietta Corporation has long demonstrated a commitment to education. Wherever our employees live and work they give of their time and talents in educational institutions. The corporation itself supports educational excellence in a myriad of ways, from scholarships to employee children to significant gifts to universities and colleges for the improvement of math and science curricula.

In Central Florida we have been part of a pioneering journey in partnerships with education. This journey has proven extraordinarily rewarding for Martin Marietta and the educational institutions involved. Perhaps of even greater importance has been its immeasurable impact on keeping our community apace with technological change and helping our citizens be prepared to contribute to a rapidly changing world.

Our training partnership with Valencia Community College has provided a continuing opportunity for resource maximization, even in today's resource scarce climate. Martin Marietta employees, from shop floor to executive office, benefit from and contribute to that partnership. Our employees serve on advisory committees at Valencia to help identify needs and develop courses that meet those needs. Martin Marietta employees teach Valencia students and attend classes taught by Valencia faculty. We exchange classroom and lab space and jointly use equipment. Co-op students from Valencia gain invaluable experience while infusing fresh ideas and enthusiasm into our workplace.

Valencia has been a key factor in our transition to a computerized work environment. A federal grant has assisted in training over 1,000 employees in the computer skills they need to manage a "paperless" manufacturing center that utilizes the latest methods and processes in manufacturing technology. This example provides the context within which this legislation can effectively contribute to the reeducation of the American workforce.

Reeducating the workforce is a critical issue due to the blinding speed of technological change. Statistics from the Department of Commerce tell us that in the years from 5000 B.C.E. to 1970 humanity reached technology- innovation level "X." Between 1970 and 1985 technological innovation doubled. It will redouble by the year 2000 and, redouble again by 2015. Those numbers alone are staggering. Yet, simple math provides us with the truly frightening realization that, technologically we are moving today at 950+ "pre-1970 equivalent years" per year. In the next decade that will accelerate to nearly 1900 "pre-

1970 equivalent years" per year. As an example, between the time we awoke and the time we will fall asleep today, technology will travel two and one half years further into the future.

In Martin Marietta's Central Florida operations, the "traditional factory worker" comprised 42% of our total workforce in 1981. Today, 24% of our employees, in a workforce identical in overall size, fall into that category. This shift from "traditional factory worker" to "knowledge-based worker" is occurring across America at a very rapid pace. Paralleling this shift, the employers' expectations of factory workers are changing. Just five years ago our assembly workers were trained in basic skills such as blueprint reading and geometric tolerancing, certified in some specialty skills such as MIL-SPEC soldering, then began working under traditional supervision. Today we expect those same people to effectively utilize their electronic work station, understand and apply complex tools such as materials resource planning and statistical process control, make timely and accurate decisions about their work, and to work together in teams to resolve problems and improve their operations. This shift in job expectations is having a monumental impact on how training is conceived, developed, and delivered in support of the new manufacturing processes. Competitive advantage for the United States clearly depends on our ability to create a world-class workforce producing world-class products.

Clearly this shift in what is needed from and demanded of our workforce is not unique to Martin Marietta or Central Florida. Just as clearly our business organizations cannot undertake this monumental reeducation task alone. This same point was emphasized in the June, 1991 Secretary's Commission on Achieving Necessary Skills (SCANS) report from the Department of Labor. The focus of H.R. 2936 and H.R. 3606 on partnerships is the fulcrum upon which this shift can be leveraged. The more than 1200 community, technical, and junior colleges across the country, in partnership with government and industry, can be the driving force in this workforce reeducation. It is also important to note that those of us in business and industry who are America's employers, need help in ensuring the emerging workforce is equipped with the basic math and reading skills that are mandatory in today's workplace. This requirement grows as our secondary school graduates' basic skill levels drop. Two-year colleges have the best record, and are clearly best prepared for the future, in delivering this remedial basic skills education.

Additionally, business, education, and government partnerships will create the primary pipeline for technology transfer. When Martin Marietta began full-scale production on the LANTIRN contract, a night-navigation and automatic targeting system for advanced fighter aircraft, included was the introduction of surface-mount technology, a then new technology in the manufacture of printed circuit boards. We have worked in conjunction with Valencia to develop expertise in that technology that not only helped make the LANTIRN system the success it was in Operation Desert Storm, but which also provides a strategic advantage to our corporation. Last week I toured Valencia's nearly completed surface mount lab, where they will now begin transferring this technology throughout the Central Florida industrial community.

H.R. 2936 refers to "retrain[ing] other workers in state-of-the-art competencies in advanced-technology occupations." Five years ago the communication technology my secretary and I used was: a felt-tipped pen, an electric typewriter, and telephones. Today, I compose memorandums on my computer, then electronically send them to my secretary for finalization and publication on her computer. This testimony was prepared entirely on my home computer. Several hours of each of my work weeks is spent in video-conference with people at Martin Marietta locations around the globe. Several of the people in my training department attended a class last week that was beamed to us via satellite from across the country. The point is, nearly all occupations today utilize advanced technologies of one type or another. The accelerating rate of technology-innovation I referred to earlier is sweeping each of us along with it. Community, technical, and junior colleges play a major role in training our administrative workforce to utilize the latest office technologies.

In order for manufacturing organizations to regain global dominance they must invest in new technologies and all the peripherals that accompany the development of new technologies. As manufacturers invest in new equipment, tools, and software to support this global competition, the federal, state, and local governments should also invest by providing the best possible conditions for the education and retraining of the workforce. Programs and partnerships, such as those provided by H.R. 2936 and H.R. 3606, will play a key role in determining the nation's future.

TIME COMPRESSION: The Phenomenon of Accelerating Technology–Innovation Change

Calender Years	Elapsed Years	Technology–Innovation Level	"Equivalent pre–1970 Years" per Year
5000 B.C.E. – 1970	6970	X	
1971 – 1985	15	2X	426
1986 – 2000	15	(2X)2	949
2001 – 2015	15	[(2X)2]2	1898

Source: U.S. Department of Commerce

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Biographical Statement

P. Douglas Grosseclose

P. Douglas Grosseclose is director of Staffing, Organization & Employee Development for the Electronics, Information & Missiles Group of Martin Marietta Corporation. His organization recruits, trains, and develops the 14,000 people of the E, I & M Group in locations around the world. The Orlando, Florida headquartered E, I & M Group has been an innovator in industrial training and development over the past decade.

Additionally, Mr. Grosseclose is executive vice president and partner in MindForms, Inc., an organizational research and consulting firm to senior executives in small companies as well as multi-national corporations.

Prior to joining Martin Marietta in 1981, he spent three years with Miller Brewing Company and ten years with Burlington Industries, Inc. Over the course of his twenty-five year career in industry he has held management positions in manufacturing, quality assurance, and human resources.

Widely published in professional journals, such as "Training" and "Quality Progress," he and his partner, Ronald E. Whittall, are nearing publication of their book titled *Strategic Leadership: Messages From the 21st Century.* He is a member of the American Society for Training and Development, the Organization Development Institute, The American Society for Organization Design & Structure, and the American Society for Quality Control. While serving on ASQC's National Technical Council from 1974-77 he was instrumental in introducing "Quality Circles" to American industry.

Mr. Grosseclose earned a BA from North Carolina Wesleyan College.

Mr. **Boucher**. Thank you very much, Mr. Groseclose.

Dr. Israel, we'll be glad to hear from you.

STATEMENT OF CARY ISRAEL, DIRECTOR OF THE ILLINOIS COMMUNITY COLLEGE BOARD, SPRINGFIELD, ILLINOIS

Dr. **Israel**. Thank you, Mr. Chairman and members of the subcommittee. I am honored to have this opportunity to present testimony on the Technical Education and Training Act of 1991 and the National Community College Technology Act.

I am the Executive Director of the Illinois Community College Board, an entity that coordinates the activities of Illinois' 50 community colleges which currently serve over 361,000 students each year.

The proposed legislation provides real solutions to difficult problems faced by the educational community in this country. These two significant pieces of legislation send a clear signal that the Nation's community, junior, and technical colleges are in the forefront of supplying this country with a skilled, literate, and technologically prepared work force—but we need your help.

A fact on which we all can agree—officials in both the public and private sectors—is that our nation must develop a skilled, world-class work force. And we must develop that work force immediately. Education and technical training beyond the secondary level is no longer a luxury. It is a matter of the economic survival of this country.

I find it interesting that some of the comments made today talked about duplication. I do not want to see duplication. However, Desert Storm has been mentioned several times, and maybe in this country, we should have an educational storm or a technological storm, and have a real commitment toward making this a great nation and an educated nation to meet the new millennium. I think the pieces of legislation will be the catalyst for that educational storm.

Technology is a real important part of our lives every day, and a basic understanding of technology will be a critical requirement of tomorrow's work force. We have reached a point where a principles of technology course probably should be part of our educational institutions' basic, core curricula. We strongly support the measures outlined in the legislation and believe that each will provide a significant step forward in the training of this country's work force.

The Associate Degree Granting College and University Partnership grants will aid community colleges in establishing innovative partnerships. Of particular interest is the potential for providing many faculty with the opportunity to be assigned to business and industry for the purpose of upgrading their technological skills.

The proposed centers of technical education and training are vital components of this legislation. Exceptional math and science programs, which could be replicated throughout the State's educational system, could significantly improve our country's competitive position.

In a report developed by a statewide work force preparation committee in Illinois, one of the recommendations generated by the Illinois Community College Board includes the establishment of regional or statewide centers of emerging technology at selected community colleges and universities. With the passage of this legislation and support from the Federal level, this dream could be realized.

A missing piece that we don't seem to focus in on is the adult education population in the community college system. It is another group desperately needing the attention of a program such as the one being discussed today.

In our State, the Illinois Board of Higher Education has recently convened a committee to study preparation of the work force. One theme that repeatedly emerged out of hearings held by the committee was that elementary and secondary schools, as well as colleges, must ensure that the development of basic skills is the first priority in preparing students.

In the community college system, there is a need for better coordination of existing services and of development of new services for adult education students to encourage their transition to credited courses. In Illinois, less than three percent of the students enrolled in adult education were concurrently enrolled in a technological or occupational course. There is a drastic need for a seamless educational system.

Students entering an adult education program must receive immediate career assessment and counseling to direct them to a goal of graduating with technological job skills rather than simply completing the work at the community college with a GED. By a seamless education, I mean that the community college must reach out to students entering the GED program and counsel them into transition to college credit courses and, if appropriate, transfer to the university of their choice.

Not embraced in the idea of a seamless educational system is the inclusion of a work-based learning experience as suggested in both bills before us today. The potential impact of these proposals on minority students, for example, is very positive.

Colleges enroll a number of minority students with basic skill needs in a GED program. In Illinois, 74 percent of all adult education students are minorities. These proposals could help encourage minority participation in areas of study and employment which are under-represented by minority populations.

Our overseas competitors in the global economy are outpacing us, and the only way for us to make up the lost ground is to improve our technological skills. There is enough blame to go around for the declining competitive position, the diminishing resources available to education, fragmented delivery systems, State fiscal woes, and so forth. But the time to assess blame is past. It is time for solutions, and this legislation is most certainly a step in the right direction.

Thank you.

[The prepared statement of Dr. Israel follows:]

U. S. HOUSE OF REPRESENTATIVES

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

SUBCOMMITTEE ON SCIENCE

Technical Education and Training Act of 1991
(HR 2936)

and

National Community College Technology Act
(HR 3606)

Testimony Presented By

Cary A. Israel
Executive Director
Illinois Community College Board

November 19, 1991

Mr. Chairman and Members of the Subcommittee, I am honored to have this opportunity to present testimony on the Technical Education and Training Act of 1991 and the National Community College Technology Act.

I am Cary Israel, Executive Director of the Illinois Community College Board, an entity that coordinates the activities of the State's 50 community colleges which currently serve over 361,000 students each year. On behalf of the 12 members of the Illinois Community College Board and officials of the State's community college system, I commend the sponsors and this committee for their visionary leadership in developing this landmark legislation. All too often, governmental bodies are content to examine an issue and simply admit that a problem exists. This proposed legislation provides real solutions to difficult problems faced by the educational community in this country. These two significant pieces of legislation send a clear signal that the nation's community, junior, and technical colleges are in the forefront in supplying this country with a skilled, literate, and technologically prepared workforce.

A fact on which we can all agree -- officials in both the public and private sectors -- is that our nation must develop a skilled, world-class workforce. And we must develop this workforce immediately! Education and technical training beyond the secondary level is no longer a luxury -- it is a matter of the economic survival of this country.

Technology is not an abstract concept relegated to a few scientists in white lab coats. It is an important part of our everyday lives, and a basic understanding of technology will be a critical requirement of tomorrow's workforce. We have reached a point where a principles of technology course should be part of our educational institutions' basic curriculum in education for employment, and that's something I intend to look at in Illinois.

Harry L. Crisp II, the Chairman of the Illinois Community College Board and owner and chief executive officer of Pepsi Cola in Marion, Illinois, is greatly concerned about the lack of skilled employees available to business and industry. He recently said, "If the United States has any hope of competing effectively in the global economy, education at all levels must ensure that our product, the students, must exhibit quality -- especially in math and science."

We strongly support the measures outlined in the legislation and believe that each will provide a significant step forward in the training of this country's workforce.

- The Associate Degree Granting College and University Partnerships grants will aid community colleges in establishing innovative partnerships with the private sector and governmental entities. Of particular interest is the potential for providing faculty with the opportunity to be assigned to business and industry for the purpose of upgrading their technological skills. Collaboration and helping each other must be the norm rather than the exception if we are to excel and prosper.

* The proposed centers of technical education and training are vital components of this legislation. Exceptional math and science programs which could be replicated throughout the state's educational system could significantly improve our country's competitive position in the global economy by helping to provide a highly developed and technically skilled world-class workforce. Illinois has already embraced this concept. In a report developed by a statewide workforce preparation committee, one of the recommendations generated by the ICCB includes the establishment of regional or statewide "centers of emerging technology" at selected community colleges and universities. With the passage of this legislation and support from the federal level, this dream could be realized.

* Outreach and Partnership Grants will significantly enhance articulation efforts of both associate-degree granting institutions and four-year institutions so that students are given opportunities to continue their academic programs at the bachelor's degree level.

* The National Technology Education Program outlined in HR 3606 would go a long way in helping Illinois and other states accomplish goals which in many cases are already in place, but due to fiscal restraints are simply unaffordable. In our state, for example, a system budget component called advanced technology equipment grants, designed to help colleges purchase new equipment for instruction and utilize emerging technologies, has been subject to significant reductions from system need request levels.

  Another important problem, that of underserved areas, could be addressed in part by these proposals. Through the use of telecommunications equipment and technologies provided via program grants, important instructional links could be formed with colleges, universities, and secondary schools in previously underserved areas.

In Illinois we have closely paralleled some of the ideas included in the bills being debated today. In an effort to prepare the future workforce for employment, a few community colleges, with established foundations, have entered into contracts, sometimes referred to as Project Succeed or Young Scholars Programs, with grade schools, junior high schools, and high schools within their districts. These colleges have adopted a class determined to be at risk of not graduating from high school and college and have guaranteed to each student tuition and book grants for college if they graduate from high school. The bills being discussed today can take this program one step further. Immediate development of a partnership with the students attending the secondary schools can be included in these programs. Community college faculty and advisors can begin working with the students to encourage math, science, and technology programs. Students can be working not only towards the goal of a college degree, but they also can be working towards graduation with skills that are needed in the technological job market.

The adult education population in the community college system is another group of individuals desperately needing the attention of a program such as the one being discussed today. In our state, the Board of Higher Education has recently convened the Committee to Study Preparation of the Workforce, composed of representatives of higher education, business, and labor. One theme that repeatedly emerged out of hearings held by the committee was that elementary and secondary schools, as well as colleges, must ensure that the development of basic skills is the first priority in preparing students for work and further education. In addition, when teaching basic skills, the application of these skills in the workplace must be stressed so that skills are viewed by students not as abstractions, but as tools for problem solving in an employment setting. In the community college system, there is a need for better coordination of existing services and development of new services for adult education students to encourage their transition to credited courses. In Illinois, less than three percent of the students enrolled in adult education were concurrently enrolled in an occupational course. There is a drastic need for a seamless educational system. Students entering the adult education program must receive immediate career assessment and counseling to direct them to a goal of graduating with technological job skills rather than simply completing their work at the community college with a GED. By seamless education, I mean that the community colleges must reach out to the students entering the GED program and counsel them into a transition to college credit courses and, if appropriate, transfer into a university with the common goal being graduation and skills for immediate employment. Not embraced in the idea of a seamless educational system is the inclusion of a work-based learning experience, as suggested in both bills before us today. The potential impact of these proposals on minority students, for example, is very positive. Our colleges enroll a number of minority students with basic skills needs in the GED program. In Illinois seventy-four percent of all adult education students are minorities. These proposals could help encourage minority participation in areas of study and employment which are underrepresented by minority populations. Business and education must mobilize together to capitalize on their comparative strengths. This will enable students to step out of the classroom and step into a job with experience, creating a definite advantage for the employer.

Not only are jobs changing into a technologically advanced environment, but workers are changing. The working age population will increase due to the maturation of the baby boomers, declining birthrates, and increased longevity. This opens the door to another type of education, worker retraining. The growing number of older workers will require community colleges to offer continuing education and retraining to learn new technologies and to fill the employment gap left by declining numbers of young people entering the workforce. We must remember that education and training do not necessarily precede employment but are continuous throughout the working life of employees. Providers of retraining programs are diverse and include not only colleges but also programs offered by trade and professional associations, state and federal retraining programs, and in-house programs designed and offered by individual businesses. We must be able to work together as a system toward the uniform goal of providing the most modern information and techniques.

At the same time, I believe it is important to look closely at the state level to insure that the administration and funding of the programs included in these proposals is directed to the appropriate state agencies or institutions. In Illinois, nearly 60 job training and retraining programs are being administered by 16 different agencies, and further fragmentation would jeopardize the intent and effectiveness of these proposals.

Ladies and gentleman of the committee, the fact is that the scientific and technical training in this country is woefully inadequate. Our overseas competitors in the global economy are outpacing us, and the only way for us to make up lost ground is to improve our technological skills. There is enough blame to go around for our declining competitive position; the diminishing resources available to education, fragmented delivery systems, state fiscal woes and antiquated business practices. But the time to assess blame is past. It is a time for solutions, and this legislation is most certainly a step in the right direction.

Mr. Boucher. Thank you very much, Dr. Israel.

Dr. Snyder, we welcome you and we'll be pleased to hear your testimony.

STATEMENT OF WILLIAM F. SNYDER, PRESIDENT, WYTHEVILLE COMMUNITY COLLEGE, WYTHEVILLE, VIRGINIA

Dr. Snyder. Thank you, Mr. Chairman and members of the subcommittee. It is my pleasure to address this proposed legislation. These bills speak strongly to concerns that I and my community college colleagues have held for some time.

There are many who believe that the work force of the United States is not competitive in today's global economy, especially in those fields that are technologically advanced. The upgrading and coordination of the country's educational efforts in science, mathematics, and technology at the associate degree level is our best chance to catch up and to do so in a relatively short time.

Community colleges are deeply involved in economic development, technology transfer, and the training and upgrading of technicians for today's work force. A national economic strategy that incorporates a focus on technology education comparable to that directed to science, engineering, and mathematics in the sixties is a strategy that will pay immediate and substantial dividends. It may in fact be the effort that keeps us in the global economic war, so it is important and indeed critical to our future that legislation such as H.R. 2930 and H.R. 3606 be enacted quickly and funded sufficiently to meet the tasks at hand.

While the Chairman, in his memorandum of November 8 announcing this hearing, has acknowledged the support of two-year colleges by several departments in the Federal Government, I must assert that Federal assistance in the area of technology education is extremely limited, and that this legislation will not duplicate existing efforts. My written testimony elaborates on this observation.

Is the National Science Foundation the right agency to carry out the technology education initiative? Only recently has the NSF acknowledged the importance of community colleges in preparing persons for productive careers in science, mathematics, and engineering. Considering the fact that the community colleges serve more than half the Americans who now begin college, the NSF's efforts have barely scratched the surface.

In the November 11, 1991 issue of "Community College Week," Elizabeth Telles of the National Science Foundation asserts, "The National Science Foundation intends to play a major role in strengthening the science, mathematics, and technology programs at two-year colleges."

Yet, in my review of the "National Science Foundation Guide to Programs: Fiscal Year 1992," just received in my office, it seems clear to me that the assertion that the NSF intends to play a major role in strengthening technology programs at two-year colleges is not backed up by programmatic and fiscal commitments. Passage of legislation like H.R. 2936 and H.R. 3606 will provide program direction and funding that will allow the NSF to fulfill its stated interests in technology programs at two-year colleges.

I would now like to comment more specifically on the proposed technology education legislation. My personal preference is the short title of H.R. 3606, National Community College Technology Education Act, because it provides overdue recognition of the role of community colleges in technology education and technology transfer.

The focus on the development of faculty in the two-year colleges is appropriate. It is particularly important that part-time faculty be included since there is a recent dramatic increase in the number of credits taught by part-time faculty in community colleges.

Course and curricular development support is also critical to the community colleges' success in improving technology education. The time and resources to engage in this process are among our institutions' greatest needs.

Securing state of the art equipment for use in technology education programs is a high priority. Improved faculty and curricula must be buttressed with funds to allow the acquisition of the most up to date instructional equipment possible.

Outreach grants such as those proposed in H.R. 2936 are important because they allow community colleges to establish and enhance partnerships with four-year institutions. Unless community colleges can bring some resources to the table, it will be difficult to get the attention of most four-year institutions.

I must add a word of caution regarding the match requirements. Increasing tuition and diminishing State and local resources are a fact of life for our nation's community colleges. Stringent match requirements will eliminate the applications at many institutions who are among those who need this assistance most.

Finally, I would like to point out that community colleges are philosophically and geographically positioned to meet many of the objectives of this legislation. A hallmark of the community college mission is to provide access to higher education to the citizens of our country. Working with non-traditional adults who have non-traditional schedules, minorities, women, the handicapped, and those who need job retraining or updating is the way most community colleges now operate.

Mr. Chairman, the three core programs in H.R. 2936, faculty development, course and curricula development, and equipment modernization, are all important national interest priorities. They will strengthen the supply of scientists, mathematicians, and engineers and will create a better supply of high-quality technicians—all necessary if the United States is to maintain its standard of living and compete effectively in the world economy.

I thank you for allowing me to appear before the committee.

[The prepared statement of Dr. Snyder follows:]

Testimony

on

Technical Education and Training Act of 1991 (H.R. 2936)

and

National Community College Technology Education Act (H.R. 3606)

by

William F. Snyder
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Subcommittee on Science
Committee on Science, Space and Technology
U. S. House of Representatives
November 19, 1991

Mr. Chairman, I am most grateful that you have called this hearing on science and technology education in two-year colleges. Thank you for the opportunity to speak to proposed legislation H.R. 2936 "Technical Education and Training Act of 1991" and H.R. 3606 "The National Community College Technology Education Act" as introduced by Mr. Price and Mr. Hoagland respectively. These bills speak strongly to concerns that I and my community college colleagues have held for some time.

Many of us are working closely not only with the businesses and industries of our area as they strive to become more productive and profitable, but with the economic development professionals and volunteers in our communities. To give you some idea of the extent to which community colleges are assisting in economic development efforts, I have attached a list of economic development activities at Wytheville Community College. In our case, as in most, there are no specific resources provided to the colleges for economic development services. The need is so strongly felt that economic development efforts are "piggybacked" on financially supported "core mission" programs.

Our college is relatively small, serving approximately 1,500 annual full-time equivalent students (FTES) in credit courses. Ours is a mostly rural 1,900 square mile service region of 100,000 citizens. Economic development and the accompanying growth in jobs, per capita income, and resources available for government services are the overriding concerns of our region. My reading of the literature on economic development and community colleges indicates that this concern is widespread. The efforts to resolve this concern are too often focused, I fear, upon ways that business and industry can be stolen from one area of the country and placed in another locality rather than on efforts to expand and improve our production of goods and services.

Generally speaking, the community college mission is focused on curricular programs. All comprehensive community colleges, technical institutes, and technical community colleges have as a part of their instructional mission the training of individuals in technology. Most have some high technology programs either in the curricular offerings or in the continuing education area. We know that the workforce of the United States is not competitive in today's global economy, especially in those fields that are technologically advanced. We know that the nation's community colleges are in the best position to address this problem. We also know and agree with the framers of these resolutions that the upgrading and coordination of the country's educational efforts in science, mathematics, and technology at the associate degree level is our best chance to catch up and to do so in a relatively short time.

Only small amounts of federal funds are currently targeted to address the shortages of technically trained workers. A national economic strategy that incorporates a focus on technology education comparable to that directed to science, engineering, and mathematics following "Sputnik" is a strategy that will pay immediate and substantial dividends. It may, in fact, be the effort that keeps us in the global economic war. So it is important, indeed critical to our future, that legislation such as H.R. 2936 and H.R. 3606 be enacted quickly and funded sufficiently to meet the task at hand.

While the Chairman in his memorandum of November 8 announcing this hearing has acknowledged the support of two-year colleges by several departments in the federal government, I must assert that federal assistance in the area of technology education is extremely limited. The Department of Education's Cooperative Demonstration Program was focused for the 1990 year on high technology as its priority program. The emphasis in this program is established each year by the Congress and the focus on high technology lasted only one year. The programs of the Department of Labor are to help persons take advantage of technology education, but have very little impact on the improvement of technology education. While two-year colleges have in recent years received some attention from the National Science Foundation, the focus of these grants has been on strengthening two-year college science, mathematics, and engineering programs, not technology. The work of other federal agencies has also been significant, but with a very limited number of institutions in highly localized projects. I believe that this legislation will not duplicate existing efforts. The programs of the Department of Education, especially the Tech Prep program of the Perkins Act and its support of occupational education, are broader in scope, and will not be diminished or duplicated by grants such as those proposed in these pieces of legislation. The work of other governmental agencies in high technology seems to create little duplication and, given the requirement for coordination and cooperation, should be complementary to the proposed focus on technology education. Programs of the type proposed by this legislation do not exist and are critical to a national economic strategy that will stop the slide in America's standard of living.

Is the National Science Foundation the right agency to carry out the technology education initiative? The National Science Foundation has a well deserved positive reputation for its work in strengthening science, mathematics, and engineering research and education in four-year colleges and universities. Only recently has it acknowledged the importance of the community colleges in preparing persons for productive careers in these fields. Even now the National Science Foundation programs as I perceive them are focused on assisting community colleges in placing more and better qualified persons in the science, engineering, and mathematics "pipeline." Yet, considering the fact that community colleges serve more than half the Americans who now begin college, the NSF efforts have barely scratched the surface. In the November 11, 1991, issue of Community College Week, Elizabeth Telles of the National Science Foundation asserts, "The National Science Foundation intends to play a major role in strengthening the science, mathematics, and technology programs at two-year colleges." In my review of the National Science Foundation Guide to Programs: Fiscal Year 1992, just received in my office, it seems clear to me that the assertion that the NSF intends to play a major role in strengthening technology programs at two-year colleges is not backed up by programmatic and fiscal commitments. Passage of legislation like HR 2936 and HR 3606 will provide program direction and funding that will allow the NSF to fulfill its stated interest in technology programs at two-year colleges.

Not only will the proposed programs meet the needs of technology education, they will also help the NSF to meet current goals. By definition, science is the observation, identification, description, experimental investigation, and theoretical explanation of natural phenomena, while technology is the application of science, especially to industrial or commercial objectives. Practically speaking, these two activities are inseparable. As one studies natural phenomena and applies the result, the activities become integrated. Scientists and technicians work as a team. Science and technology blend and feed upon one another. Too often the scientist spends much of his time applying the science which he investigates. When technologists join the team, more of the scientist's time is spent in the pure science area, while his partner works more in the application of the knowledge. With the availability of trained technicians in high technology areas, we will create additional scientist man-hours without training or creating any additional scientists, engineers, or mathematicians. The fact that these disciplines blend makes it logical to me that by emphasizing technology education the National Science Foundation can advance its long-stated objective of improving our national effort in science, engineering, and mathematics. We will also create additional individuals who begin their work in technology and develop interest and capabilities that will contribute to the fields of science, mathematics, and engineering. Some of them will seek further education and become qualified scientists, engineers, and mathematicians. Technology education then contributes to the number of persons in the science, engineering and mathematics pipeline. Since so-called non-traditional students are now the majority population in higher education, the role of community colleges becomes increasingly important to such a goal.

The National Science Foundation has a well deserved reputation for providing and administering grants that clearly focus on a national agenda. I participated in a teacher enhancement grant in the sixties which earned my admiration for the quality of both content and implementation of NSF administered programs. In my opinion, the National Science Foundation has been and is an agency that does quality work.

Given the close relationship between the content areas presently assigned and those proposed, and based on the quality of this agency, I believe it to be in the national interest to add this new major assignment to the work of the National Science Foundation.

Finally, I would like to comment more specifically on the proposed technology education legislation. I prefer the short title of H.R. 3606 -- "National Community College Technology Education Act," because it provides overdue recognition of the role of community colleges in technology education and technology transfer.

The focus on development of faculty in the two-year colleges is appropriate. It is particularly important that part-time faculty be included since there is a recent dramatic increase in the number of credits taught by part-time faculty in community colleges. This is particularly true in the technologies, since practicing scientists, engineers, and technicians are the most readily available source of faculty who are up-to-date and knowledgeable about the fields identified in this legislation. Many part-time faculty, while technically knowledgeable, have deficiencies in communication skills, instructional technology, and teaching and learning theory. Full-time faculty are struggling mightily to teach their heavy course loads and at the same time keep up with rapid changes in technology.

Course and curricular development support is critical to the community college success in improving technology education. The time and resources to engage in this process are among our greatest needs.

Securing state-of-the-art equipment for use in technology education programs is a high priority. An allowance to permit renovations to accommodate the equipment should be permitted. Funds for equipment

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replacement in Virginia now allow updating every ten (10) to twenty (20) years. In technology education this is an intolerable situation since technology is changing so quickly. Improving faculty and curricula must be buttressed with funds to place in the faculty's hands equipment needed to facilitate the instructional process and to make possible the useful application of gains made through faculty enhancement and curriculum development.

Grants to develop and strengthen partnerships in mathematics and science education in secondary schools and communities served by the colleges are also an important activity. They will complement and enhance the national curricular reform stimulated by the Perkins Act Tech Prep Program. It would seem more appropriate, though, that these provisions in H.R. 2936 be placed in an existing NSF program area such as Education and Human Resources which currently deals with science and mathematics in secondary schools and colleges.

A word of caution regarding the match requirements for federal grants. The American Association of Community and Junior Colleges (AACJC) and other such organizations can testify to the fact that increasing tuition and diminishing resources are a fact of life for our nation's community colleges. At least twenty states have balanced their current budgets on the backs of higher education and, in particular, the most vulnerable part of that system -- community colleges. Budgets are stretched to the limit. Stringent match requirements will eliminate the applications of many institutions who are among those who need this assistance most. If the match is to be "additional," it will penalize those who already recognize and are working to meet the objectives stated in this legislation.

Outreach grants, such as that proposed in H.R. 2936, are important because they allow community colleges to establish or enhance partnerships with four-year academic institutions. Unless community colleges can bring some resources to the table, it is difficult to get the attention of four-year institutions. The limitation of $25,000 may be too severe unless consortia or community college systems are allowed larger grants. Consortia or systems of community colleges should be allowed up to $100,000 per grant if a minimum of five colleges of each type (community colleges and four year universities) are involved. Relationships with public schools are more fully developed. Examples of Wytheville Community College/public school partnerships are found in an attachment.

I should also like to point out that community colleges are philosophically and geographically positioned to meet many of the objectives of this legislation. For example, these bills direct that men and women from all backgrounds should be given more opportunities to pursue advanced training. A hallmark of the community college mission is to provide access to such citizens of our country. Working with non-traditional adults who have non-traditional schedules, minorities, women, handicapped, and those who need retraining and updating while employed is the way most community colleges now operate. We do not limit ourselves to an academic year or a traditional school day. We schedule and provide programs year around, day and night, seven days a week. We already work in a collaborative way with local employers. We have many student target groups and are deeply involved in programs and services for dislocated workers, readjustment act clients, dropouts, and non-high school completers. We are proud of our flexibility.

The private sector already recognizes the symbiotic relationship which exists with local community colleges. There are numerous examples of close relationships between the private sector and community college. With this legislation, these partnerships can be built upon.

I endorse the National Advisory Committee as suggested in the legislation. Representatives from industry should include organizations of all sizes. I suggest that it might be helpful if grant recipients were required to create a parallel local advisory group to ensure that local needs are met. The membership should parallel that of the National Advisory Committee.

The definition of technology as found in H.R. 3606 rather than the listing of specific fields as found in H.R. 2936 may prove more flexible and useful.

Mr. Chairman, the three core programs in H.R. 2936 -- faculty development, course and curricula development, and equipment modernization -- are all important national interest priorities. They will strengthen the supply of scientists, mathematicians, and engineers and will create a better supply of high quality technicians -- all necessary if the United States is to maintain its standard of living and compete effectively in the world economy.

Thank you again for allowing me to appear before you to support this legislation which addresses critical national needs.

WYTHEVILLE COMMUNITY COLLEGE
ECONOMIC DEVELOPMENT ACTIVITIES
(Partial List)

-Mission and Values Statements embrace the importance of economic development

-Wide range of academic programs to educate the area citizenry and improve the quality of the workforce

-Efforts to secure Small Business Assistance Center

-ARC Grant for Wood Products Development in Southwest Virginia

-Participation in Consortium for Manufacturing Competitiveness - Southern Technology Council of Southern Growth Policies Board

-Participation in Southeastern Manufacturing Technology Center

-Southwest Virginia Apprenticeship Program

-Smyth Education Center

-WCC Center for Economic Development

-Office of Technology Transfer and Assistance

-Blue Ridge World Trade Association

-Relationship with Industrial Training Division (New Industry Training)

-Participate with localities in their efforts to be designated "Certified Business Communities"

-Organized Consultation on Tourism Training

-Certified SmartCAM Training Center

-Certified AutoCAD Training Center (pending)

-Business Partnership Awards from Virginia Council on Vocational Education

-Development of Regional Dental Hygiene and Regional Physical Therapist Assistant Programs

-Conduct Industrial Training Needs Assessments for businesses and industries

-Customized training for business and industry through Office of Continuing Education

-Leadership Training Programs

October 1991

-WCC Council for Economic Development (Members from within college)

-Curricular and community advisory committees

-JTPA Programs

-Efforts to secure resources for Advanced Manufacturing Center

-Participation in area Chambers of Commerce

-Employee Development Director program (Workplace education)

-Contributions to the work of the Southwest Virginia Economic Development Commission (Lacy Commission) and use of that report to guide WCC's economic development efforts

-Member of two task forces of the Blue Ridge Economic Development Commission -- Education and Training; Partnerships

-Virginia Economic Bridge Program Partner and member of advisory board

PUBLIC SCHOOL - WYTHEVILLE COMMUNITY COLLEGE PARTNERSHIPS

I. Crossroads Consortium

The superintendents of the city and county public school systems and the president of the community college have joined together to establish THE CROSSROADS EDUCATIONAL CONSORTIUM for the purpose of developing strong cooperative programs to prepare for a variety of career opportunities. Current partnerships include:

Tech Prep

Dual Credit

Governor's School

Federal Programs - Upward Bound and Educational Talent Search

Articulation Agreements - Covering six specific programs
- Drafting
- Machine Shop
- Secretary, Office Systems Technology
- Data Processing
- Computer Information Systems
- Electronics

Federal and State Work-Study Programs

Data Sharing - Student Readiness Information

College Use of Public School Faciltiies as Regional Sites

II. Other Joint and/or Cooperative Activities

Personnel serve on various Secondary School and College Advisory Committees

Judges for various Competitions --
- Science Fair
- MACC
- Forensics
- Odyssey of Mind
- Math
- Beauty Contests

Occasional Sharing of Facilities for Special Courses and Programs including:
- Tennis Courts
- Band Room
- Audio-Visual Equipment
- Home Economics Rooms
- Use of School Facilities as Regional Sites

Cultural Programs at sites in some schools during the day and on campus in the evenings

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Equipment Loans and Surplus Equipment

AACJC Nursing Articulation Project

Practical Nursing Joint Program

Dental Assistant Articulation Agreement - Mercer County Technical Education Center

Career Day Programs

College Day Programs

Career Exploration Tours

Interest Testing and Career Counseling

Area Science Fair

Enrichment Courses
  Reading
  Computers

Middle School Summer Enrichment Program

Counselor/Principal Seminar

High School Faculty - Adjunct at WCC - participate in in-service training

Professional Development and Recertification for Teachers

Artist in Residence Program

Arts and Crafts Festival - Special school categories

Minority Affairs - Black History Week Program, Dances

Student Government Association Dances - High School students invited on occasion

Volunteers in Schools - Phi Theta Kappa

Tutors at Rgional Sites for High School Students

Mr. **Boucher**. Thank you very much, Dr. Snyder.
Dr. Gianini?

STATEMENT OF PAUL C. GIANINI, JR., PRESIDENT, VALENCIA COMMUNITY COLLEGE, ORLANDO, FLORIDA; CHAIRMAN, JOINT COMMISSION ON FEDERAL RELATIONS OF THE AMERICAN ASSOCIATION OF COMMUNITY AND JUNIOR COLLEGES AND OF THE ASSOCIATION OF COMMUNITY COLLEGE TRUSTEES

Dr. **Gianini**. Thank you, Mr. Chairman and members of the subcommittee. I am Paul Gianini, President of Valencia Community College, a public, associate degree-granting institution serving approximately 60,000 students in Central Florida.

Last February as Operation Desert Storm was ending, the President of Martin Marietta Electronics, Information and Missiles Group, Mr. Alan Norton, testified before a U.S. Senate subcommittee about his partnership with Valencia. His company products, including the PATRIOT missile contributed to our Desert Storm efforts. Mr. Norton said, "We've invested millions of dollars in R&D and manufacturing programs, yet this investment means little unless our employees are properly trained...Martin Marietta's ability to prosper in today's challenging environment will, to a large extent, be decided on the factory floor where high quality training programs like those offered by Valencia Community College are critical to our continued success."

His comments apply to the consideration of the legislation before you. All of the Federal investment in research and development through NSF and others really means little unless trained employees are available to put the resulting technological advances to work on behalf of America's economy.

I am particularly pleased that both of the bills before you direct the National Science Foundation to act in concert with the private sector and two-year college leaders to strengthen instruction in advanced technology at two-year colleges and to support a variety of partnership arrangements. The National Advisory Council proposed in the bills will be a highly effective means of ensuring that the programs funded through NSF will have appropriate direction.

The programs proposed in the bills under consideration can be of strategic importance in maximizing the use of resources at colleges like Valencia. For example, with the aid of corporate and public grants, Valencia has created a teaching factory used to demonstrate advanced manufacturing techniques and for training and retraining of workers.

The proposed National Advanced Technical Education and Training Program will advance this work and complement and build on the Department of Education's Cooperative Demonstration Grant model. We have had five cooperative demonstration grants and find that the program has been hampered by limited funding and restrictions placed on the use of the funds.

Curriculum development, faculty development, state of the art equipment acquisition, and partnership building among all educational systems are appropriate uses for Federal funding. Few other funding programs exist to meet these needs in high-tech areas, and I strongly support their inclusion in the legislation.

The proposed National Centers for Technical Education and Training can play a critical role. As a group, the 10 institutions selected can provide effectively not only in sharing resources and solutions but in identifying new problems to be addressed, in evaluating effectiveness, and in inviting private sector partnerships in solving problems. A similar centers of excellence model has worked for us in Florida in addressing high-tech training needs.

Mr. Chairman, the legislation before you will make a significant and very timely contribution to this country's economic health. We have in place in our nation a network of 1,200 two-year colleges that are ready and willing to be put to use to build our economy.

There is no debating the fact that it is the Nation's community colleges that will train the work force of the future. I commend the sponsors for the timeliness of this legislation, which was brought home to me forcefully last week by a speech made at Valencia by the Assistant Secretary for Technology Policy of the United States Department of Commerce, Ms. Deborah Wince-Smith. She told an audience of 800 that despite the fact that the United States spends almost as much on research and development as Japan, what was once West Germany, France, and the United Kingdom combined, enabling us to lead the world in generating new scientific knowledge and in creating new technologies, this lead alone has proven to be an insufficient competitive edge.

We have lost market shares to the competition in key technologies that we pioneered and in which we once dominated the world. To regain our leadership in using technology competitively, we must translate technology into timely, cost-competitive, high-quality manufactured products, and we must have a quality work force that is educated, trained, and flexible in adapting to technological and competitive change.

Certainly, Ms. Wince-Smith's words echoed the remarks of Alan Norton from Martin Marietta that I shared with you earlier.

These concerns drive our actions at Valencia. Those of us who have taken the lead can in turn help others to work cooperatively to build a strong community-based network that can enable this nation to maintain its strengths and regain lost markets.

I commend the Congress for considering this legislation. I assure you that our faculty and students have the drive and ambition that is needed to build on our rich heritage of technological achievement. We will use the resources provided by the Congress to lead this nation across the technological frontiers of the 21st Century.

Thank you.

[The prepared statement of Dr. Gianini follows:]

Testimony

on

Science and Technology in Two-Year Colleges as addressed by

The Technical Education and Training Act of 1991 (H.R.2936)
and
The National Community College Technology Act (H.R. 3606)

Paul C. Gianini, Jr.
President
Valencia Community College
Orlando, Florida

before the

Subcommittee on Science
Committee on Science, Space and Technology
United States House of Representatives

November 19, 1991

Mr. Chairman and members of the subcommittee, I am Paul Gianini, president of Valencia Community College, a public, comprehensive, multi-campus, associate degree-granting institution established in 1967, and serving two counties in Central Florida with an enrollment of over 60,000.

I am pleased to have the opportunity to speak to you today about strengthening the teaching of science and technology in two-year colleges through the Technical Education and Training Act of 1991 (H.R.2936) and the National Community College Technology Act (H.R. 3606).

I'd like to begin by sharing with you an excerpt from the testimony of the president of Martin Marietta Electronics, Information & Missiles Group, Mr. Alan Norton, who testified before the U. S. Senate Subcommittee on Labor and Human Resources on February 21, 1991.

His testimony, a complete copy of which is attached, took place as Operation Desert Storm was ending. His company's products, including the Patriot Missile and the LANTIRN night vision system contributed to our Desert Storm efforts and are manufactured in Orlando with Valencia faculty, students and graduates helping in the production.

Mr. Norton said, "We have invested millions of dollars in the equipment and processes that support our R & D and manufacturing programs, yet this investment means little unless our employees are properly trained . . . The Valencia staff and faculty have become an extension of our own company staff and we rely upon them as we would our own employees. . . Also, the quality of our vendors' products is improved through Valencia training. . . Martin Marietta's ability to prosper in today's challenging environment will, to a large extent, be decided on the factory floor where high quality training programs like those offered by Valencia Community College are critical to our continued success."

Mr. Norton's comment about his company's investment in R & D and manufacturing technologies, and his reliance upon community college training programs, can be applied to the subcommittee's consideration of the legislation before it today. All of the federal investment in research and development through the NSF and other agencies really means little unless trained employees are available to put the resulting technological advances to work on behalf of America's economy.

For this reason, I am particularly pleased that both of the bills before you direct the National Science Foundation to administer grant programs that will strengthen instruction in advanced technologies at two-year colleges, and that would support a variety of partnership arrangements for colleges. The National Science Foundation's support of two-year institutions and curriculum issues must be strengthened if our country is to overcome serious shortages of scientists, engineers and technical "knowledge based" workers. NSF needs direction from Congress to place an emphasis on undergraduate students, laboratories and curricula - an emphasis that is of the same high quality as its outstanding support of critical research. The National Advisory Council on Advanced Technical Education and Training proposed in the bills will be a highly effective means of ensuring that the programs funded through NSF will have appropriate direction from the private sector and from those at two-year colleges who have demonstrated success and excellence in technology training. The Advisory Council's role would be complemented by a requirement that representatives of associate-degree institutions, business and industry, and economic development organizations represent the majority of the readers for grants considered as a result of this legislation.

Community colleges are well positioned to take leading roles in technology training across this nation, and many of us have made significant contributions in the last few years in this arena. My own institution is a good example:

- With the aid of IBM and other corporate donors, and state and federal grants, we have created a "teaching factory" that we use to demonstrate advanced manufacturing techniques and to train workers who are already in the workforce as well as new college students.

- Valencia is the lead institution for the Central Florida Manufacturing Technology Transfer Center, with the 52 companies served to date reporting measurable productivity gains as a result of our technology transfer partnership.

- Our computer integrated manufacturing training program won the U. S. Secretary of Education's 1990 Award for the most outstanding technical training program in the Southeast.

- We competed for and won five Cooperative Demonstration grant awards from the U. S. Department of Education used for high-tech training in the defense, telecommunications, health and film industries.

- We created a film technician training program that is widely credited for playing a key role in enabling the film industry to establish a foothold in Central Florida.

- We have extensive credit and non-credit training programs with Central Florida business and industry. During the past year for example, we provided training for over 300 businesses of many types and sizes, exemplified by large companies like AT&T, Martin Marietta, Stromberg-Carlson and Walt Disney World, and small companies like Automation Technologies and Infrared Industries.

- We have a strong "Tech Prep" program with our two local school districts that will lead to more students completing high school and going on to the community college before entering technical careers.

Federal, state and private grant funds have been instrumental in positioning Valencia as a key player in the economic health of Central Florida. The college is poised at an important point in the development of its capacity to contribute to economic development, and the programs that are provided in the two bills under consideration would be of strategic importance in maximizing the use of resources that have been marshalled at colleges like Valencia on behalf of the national interest.

The proposed National Advanced Technical Education and Training Program will complement and build appropriately on the U. S. Department of Education's Cooperative Demonstration grant model, and placement within NSF can ensure a strong emphasis on the scientific and technological expertise required for effective training programs in technical competencies in strategic fields.

It has been our experience with our five Cooperative Demonstration grants over the past three years that the partnerships required with business and industry for these programs to be successful are essential if the training is to meet industry standards. However, the Cooperative Demonstration grant program has been hampered by limited funding combined with restrictions placed upon the use of Cooperative Demonstration program funds. These restrictions include prohibitions against purchasing training equipment, a focus on demonstrations as opposed to developmental activities, and limitations on the types of industries served. For example, building construction was the sole focus of the program this past year. These restrictions have meant that this program has played an important but severely limited role in meeting the high-tech training needs of the nation. The two bills before you today would make significant contributions beyond and would not duplicate what is made possible under the Cooperative Demonstration grant program.

As does the Cooperative Demonstration grant program, the proposed legislation requires the direct involvement of business partners in designing and delivering training. I applaud this requirement not only because it leads to high quality training, but also because it helps to initiate lasting college-employer partnerships that live long after the federal funding ends.

At Valencia, the grant funded training programs have lead directly to extensive private sector financial support. For example, IBM has donated $1.5 million in hardware and software to Valencia in the last few years, and our relationship with the company is rooted in grant-funded business and industry training programs.

Curriculum development, faculty development and state-of-the-art equipment acquisition are appropriate uses for federal funding, few other funding programs exist to meet these needs in high tech areas, and I strongly support their inclusion in the legislation.

The inventory of training programs proposed in H.R. 2936 will help to prevent duplication of effort. Valencia has developed such an inventory of its business and industry training programs, including the number of employees trained and in some cases a measurement of productivity gains by industry. If these data are captured in the inventory, it can also serve as an evaluation tool for the programs funded.

The National Centers for Technical Education and Training proposed in H.R. 2936 can play a critical role in maximizing the investment of federal funds in advanced tecnical training. The colleges that are funded can serve as one-stop information sources for other colleges in their regions and also as "living laboratories" where training programs can be developed. As a group, the ten institutions selected can provide effective leadership not only in sharing resources and solutions, but in identifying new problems to be addressed, in evaluating effectiveness, and in inviting private sector partnership in solving problems of regional and national scope.

In Florida, the Florida High Technology and Industry Council has effectively used the "Centers of Excellence" model suggested in the legislation to designate colleges to lead high-tech training efforts. Valencia is proud to have been selected as one of these centers in electronics and in computer integrated manufacturing. As a result of our work, many colleges already turn to Valencia for assistance in curriculum development, laboratory design and business and industry partnership issues. Those of us who are already looked to as leaders in this type of training would welcome an opportunity to compete for funding so that we might formally offer assistance and follow-through services to other institutions that are replicating and adapting our advanced technology training programs.

I am also pleased to see in H.R. 2936 proposed funding for at least 20 mathematics and science partnerships between secondary schools and community colleges, and for partnerships between associate degree-granting and baccalaureate degree-granting institutions. Efforts to articulate mathematics and science education at all levels are critical if students are to develop the kinds of skills required of "knowledge-based" workers, who are the employees required to run the factories and businesses that can withstand international competition. I am aware of no available funding opportunity specifically targeted at improving articulation among all levels of mathematics and science education, yet articulation is absolutely necessary if we are to ensure a seamless educational "pipeline" that supports students throughout all stages of the educational process.

I know that efforts to create such partnerships can be very effective. Valencia has been working in close partnership with the University of Central Florida to improve the success of our students who transfer there for their upper division work. Significantly, over 80% of Valencia's students who continue to the upper division attend UCF, and community college transfer students make up over 75% of all upper division students at UCF. We have sponsored joint meetings of faculty in a variety of departments that have yielded a variety of recommendations such as joint curriculum review and faculty development activities that would improve the success rate of students who transfer.

We have already developed a very successful transfer student advisement and orientation program that we would be pleased to share with other institutions. The partnership grants made available under H.R. 2936 would be an ideal source of seed funding to initiate new joint developmental activities and to share our successes with others. Undoubtedly the number and quality of science and mathematics graduates would increase as a result.

This effort would take on added, special importance since in Florida 80% of all new teachers now come from the community college system. If we are to strengthen the K-12 science and mathematics experience, we must strengthen science and mathematics in our community colleges.

H.R.3606 provides for programs to strengthen cooperative working relationships between community colleges and the military, supporting the exchange of instructors, instructional materials, educational methods, technology and other expertise. Also, the bill provides for opportunities for faculty to have short-term assignments in industry and for the sharing of program and equipment costs with industry. These programs can play a significant role in ensuring that faculty are aware of state-of-the-art applications of technology.

At Valencia, we have strong partnerships in place with local industry that enable us to offer courses using equipment owned by industry ranging from expensive metal working machines at Martin

Marietta to movie production equipment and supplies from Walt Disney World and Universal Studios. Also, we are developing programs to assist in the transition of military personnel who are separating from the military due to down-sizing, and to assist industries that have been dependent upon defense contracts to convert their production processes to produce goods for the civilian market. The exchange of ideas and resources that results from these relationships with industry and the military benefits our faculty and our students, and reduces program costs since resources are shared. I am glad to see this kind of sharing encouraged by the proposed legislation.

Mr. Chairman, the legislation before you will make a significant and very timely contribution to this country's economic health. We have in place in our nation a network of over 1200 community, technical and junior colleges that is ready and willing to be put to use to build our economy. There is no debating the fact that it is the nation's community colleges that will train the workforce of the future. Over half of all college freshmen now enter the community college. Significantly, 85% of the workforce for the year 2000 is already working today, and it is the two-year college that has the mission and the ability to train and re-train these persons as technology advances. I commend Congressmen Price and Hoagland and the co-sponsors of these bills for seeking cost-effective solutions that will spring from partnerships among educators, business and industry, employees and government.

The timeliness of this legislation was brought home to me forcefully by a speech made at Valencia last week as a part of our week-long Celebration of Academic Excellence by the Assistant Secretary for Technology Policy of the U. S. Department of Commerce, Ms. Deborah Wince-Smith. She told an audience of 800 high school honors students, Valencia students and faculty, and business and industry advisory committee members that the United States spends almost as much on research and development as Japan, what was once West Germany, France and the United Kingdom combined, enabling us to lead the world in generating new scientific knowledge and in creating new technologies.

However, she warned that this lead alone has proven to be an insufficient competitive edge. We have lost marketshares to the competition in key technologies that we pioneered and in which we once dominated the world. She pointed out that we have to regain our leadership in using technology competitively, and that to do that we must translate technology into timely, cost competitive, high quality manufactured products, and that we must have a quality workforce that is educated, trained and flexible in adapting to technological and competitive change.

Ms. Wince-Smith's words echoed the remarks of Alan Norton from Martin Marietta that I shared with you earlier. Our nation and individual companies, like Martin Marietta, can lead in R & D, but without the workers needed to enable us to be first to the market with products based on the new technologies conceived in American laboratories, we will continue to lose our share of the international market.

These concerns drive us at Valencia and at other leading edge community colleges around the country. Those of us who have taken the lead can in turn help others to work cooperatively with secondary schools and four-year institutions and to build a strong community-based network that can enable this nation to maintain its strengths and regain lost markets. I commend the Congress for considering legislation like H.R.2936 and H.R. 3606. I assure you that our faculty and students have the drive and ambition that is needed to build on our rich heritage of technological achievement, and we will use the resources provided by the Congress to lead this nation across the technological frontiers of the 21st century.

Thank you.

BIOGRAPHICAL STATEMENT

DR. PAUL C. GIANINI, JR.

Dr. Paul C. Gianini, Jr. is president of Valencia Community College, a multi-campus, associate-degree granting, public institution serving over 60,000 students in Central Florida. Prior to assuming the presidency of Valencia in 1984, he was president of Spoon River College in Illinois. He also held positions as Vice President for College Services, Dean of Student Personnel Services and Assistant Professor of Psychology for Northampton County Area Community College in Bethlehem, Pennsylvania.

Dr. Gianini earned Ed.D. and Ed.S. degrees from the University of Florida, a Master of Education degree from the University of Nebraska, and a Bachelor of Arts degree from Yankton College.

His professional and civic commitments include service as chairman of the Joint Commission on Federal Relations of the American Association of Community and Junior Colleges and the Association of Community College Trustees, and membership on the Board of Directors and Executive Committee of the American Association of Community and Junior Colleges.

Also, he is a member of the Vocational Education Subcommittee of the Florida High Technology and Industry Council; the Florida Space Research Foundation/Astronauts Memorial Foundation Advisory Committee, University and College Task Force; and of the Boards of Directors of the Greater Orlando Chamber of Commerce and of the Kissimmee/Osceola County Chamber of Commerce.

Dr. Gianini received the Holocaust Memorial Center of Central Florida's Contribution and Leadership Award in March 1991. Among his recent publications is "Opportunity from Strength: Linking Comprehensive Planning and Resource Development," co-authored by Michael Hooks, published in Conceptualizing 2000: Pro-Active Planning, edited by Dr. Dan Angel and published in 1991 by the Community College Press.

Attachment to the testimony of Paul C. Gianini

Testimony

on

The Higher Education Act Reauthorization

Allan M. Norton
President
Martin Marietta
Electronics, Information & Missiles Group

before the

Subcommittee on Education, Arts and Humanities
Committee on Labor and Human Resources
U.S. Senate

February 21, 1991

Mr. Chairman and members of the committee, I am Allan M. Norton, president of Martin Marietta Electronics, Information & Missiles Group employing more than 10,000 in Central Florida.

It is indeed a pleasure to appear before you today to talk about the Higher Education Act, specifically its support for outstanding partnership efforts between industry and higher education. Some background about Martin Marietta is needed to appreciate a unique partnership that has evolved between my company and Valencia Community College - a partnership that we believe provides a model for the Congress to consider.

Martin Marietta Electronics, Information & Missiles Group designs, develops, and produces a wide variety of high technology defense systems that support the United States and its allies.The Patriot missile and LANTIRN night vision system, which are being used by our troops in Operation Desert Storm, are examples of our products.

Workers called upon to produce such leading edge technologies require education programs of the highest quality. Valencia Community College, with partial support from federal funds, helps us meet this need. Specifically, our training staff analyzed the workforce training needs in order to establish a world class "paperless factory." This factory uses computer technology to make our operations highly efficient and to maximize product quality.

Valencia responded by working with our engineers to custom design a 40-course high tech educational program. A federal grant is assisting in offering that program to nearly 700 employees. The Valencia staff and faculty have become an extension of our own company staff, and we rely upon them as we would our own employees.

We have invested many millions of dollars in the equipment and processes that support our R&D and manufacturing programs, yet this investment means little unless our employees are properly trained. For example, Valencia's computer literacy courses enable our workers to more effectively use our 6,300 computers. Also, the quality of our vendors' products is improved through Valencia training.

These specific training programs are but one part of a multi-faceted partnership. For example:

o Martin Marietta employees serve as Valencia adjunct faculty bringing state-of-the-art concepts into the college's classrooms

o Our company's Production Technology Training Center and other facilities support Valencia instruction

o Martin Marietta professionals actively serve on business advisory committees for Valencia's Center for High Tech Training for the Disabled; data processing, electronics, laser and engineering related department; and the science department

o As technology leaps ahead at the company, our engineers assist in Valencia course design keeping the curriculum up to date

o Martin sponsors industry and business seminars at the college on topics such as Total Quality Management

o Martin Marietta assisted in establishing Valencia's Central Florida Technology Transfer Center in computer integrated manufacturing serving over 700 small and medium sized businesses

o In 1990, Martin Marietta funded a $75,000 endowed chair in mathematics at Valencia

o Valencia alumni employed by the company established a scholarship fund for employees who attend Valencia.

Federal funds strengthened this model partnership. One measure of its strength and quality is receipt of the 1990 U.S. Secretary of Education Outstanding Vocational Program Award by Valencia. We urge continued support for community college/private sector partnerships and for two-year/four-year college partnerships that enable students to progress smoothly and be retained.

Student success is especially critical to companies like Martin Marietta that need engineers and scientists, and whose employees need skill upgrading as technology progresses.

We are grateful to Congress for its special support for community college participation in Title III of the Higher Education Act, and urge you to allow colleges like Valencia that have successfully used these funds to continue to participate in Title III.

Martin Marietta's ability to prosper in today's challenging environment will, to a large extent, be decided on the factory floor where high quality training programs like those offered by Valencia Community College are critical to our continued success.

Thank you. It has been my pleasure to appear before this committee.

Mr. **Boucher**. Thank you very much, Dr. Gianini. The subcommittee thanks all of the witnesses for their attendance here this morning and for the information and recommendations that they have shared with us.

Before I turn to specific questions about this legislative proposal, let me ask our community college witnesses just to comment generally on the extent to which the National Science Foundation, through its range of programs that support community colleges, limited as they are in funding, have been of help to you. To what extent in Illinois have the community colleges taken advantage of existing NSF programs? The same with regard to Southwest Virginia and the State of Florida.

Dr. Israel, would you care to begin answering that question?

Dr. **Israel**. Yes, sir. I was before this subcommittee two years ago when I was in Colorado. I moved to Illinois a year ago.

I'll say what I said two years ago in front of Chairman Walgren. That is, NSF is very important to the community colleges, but again, we need more attention and certainly a better share of funding if we have 43 percent of all undergraduates in the country.

In Illinois, we have 64 percent of all undergraduates in public and private universities at the community colleges. Yet, we again get a paltry sum from NSF.

What is interesting to note—and then I'll stop—is that what NSF doesn't seem to consider is that approximately 15 percent in the State of Illinois of our undergraduate students already have a baccalaureate degree or higher. They are coming back to be retrained and reeducated because of the technology.

So we are not dealing with students directly out of high school. Our average age is 30, as you know, throughout the country, but 15 percent of our students already have a degree and they need to be retrained in technology.

Again, I think the legislation would be helpful, and a push from this committee toward NSF would be helpful.

Mr. **Boucher**. Dr. Snyder?

Dr. **Snyder**. We have had one program within NSF and it was a very successful program a few years ago. But still, NSF is focusing on science, engineering, and mathematics and not on the advanced technology.

This, I think, is a gap in the programing that NSF says they want to participate in. It would seem to me that you would have to have legislation that would direct them to participate in that.

Mr. **Boucher**. Dr. Gianini?

Dr. **Gianini**. Mr. Chairman, our experience with NSF has been somewhat limited, but more by their action than ours.

What we really need—and not to speak against NSF because I think they do some wonderful work—but we need to use the community colleges as the bridge between the universities who are doing the pure research and then being able to take that and apply that research on the floor of the American workplace. That is what's missing in our country.

It is a natural marriage in terms of what is being proposed in the legislation before you. In terms of actual success with community colleges, I think you can see from the figures that it has been marginal, extremely marginal, throughout the country. While we have received verbal assurance that there is a tomorrow, the same verbiage is in place and has been for years, but basically, we've been ignored.

Mr. BOUCHER. Again, before turning to the specifics of these two bills, let me ask you to evaluate briefly—again, I direct this question to our community college witnesses today—the other Federal programs that are designed to provide technology training, such as the Tech Prep program that is administered by the Department of Education and any programs that you may be aware of and have had some experience with emanating perhaps from the Department of Commerce.

Dr. Gianini?

Dr. GIANINI. Mr. Chairman, I think the Tech Prep question is easily answered. That program is designed to start in the junior year of high school. Right now though, we know that 85 percent of the work force that will be in the workplace in the year 2000 is there. They have already finished high school and/or college, and are in the workplace. So Tech Prep is a wonderful program, but it is not germane to what American needs in terms of its development of its technologies.

In terms of the Cooperative Demonstration Grant—and we have a good track record so I think I can speak with some authority—they are small. They are very limited in the use of their funds. Often there are whole years that go by where we are not even eligible to participate.

For example, in 1991, the total monies were directed toward projects in construction with an emphasis on masonry. I don't consider masonry high-tech. Maybe it is nowadays; I don't know. But you can see that they are limited.

They have had other years when they were specified for truck driving. This is not technological demonstration grants that can be replicated throughout our country. The purpose of them was to create models that could be used elsewhere.

We were successful in the ones we received, but it is a very limited program. They don't address faculty development. They don't address equipment acquisition. So it is really a wonderful program for what it was intended to be, but that is very narrow in scope and is not duplicative of what we are talking about today in these bills.

Mr. BOUCHER. Dr. Snyder?

Dr. SNYDER. I think the Perkins Act is a wonderful piece of legislation which is of great help to both vocational schools at the senior high school level as well as community colleges, but I think that it does not give the kind of attention to technology education that this bill would and that is needed. It's a broader bill. It just simply does not speak to that narrow focus that is so critical to our preparation of the work force.

Mr. BOUCHER. Dr. Israel?

Dr. ISRAEL. I thought Congressman Price handled that question really well, and I don't want to be redundant to what my colleagues have said. I would just like to add what I said in the beginning of my testimony.

That is, we need a curriculum in these centers of excellence. We could start developing curricula, inter- technology, to be a core, a part of our curriculum.

Also, the adult education student that I alluded to—we cannot find them in Tech Prep or Perkins and so forth and, unfortunately, in our core cities. That's where the bulk of the students are starting. Certainly, Tech Prep didn't envision 15 percent of our undergraduates being recipients of a baccalaureate degree.

Mr. BOUCHER. I understand your general statement then that the Federal Government today is not providing adequate resources to community colleges for technology training. Where to you get your money from for the technology programs you presently administer? Does it come out of your general publicly-funded operating budget as provided by States and perhaps local governments in some cases? Does it come from industry? What is the general level of funding that you have for these programs in comparison with others? Do you sense that they are seriously under-funded?

Dr. GIANINI. Mr. Chairman, there is something called the Sunshine State Skills Act which is basically open competition for a community college to work with business and industry. The total funding this year was $500,000 for the entire State of Florida.

Now, Florida has learned that it cannot exist as a service economy. It needs more than sunshine and Mickey Mouse to make a go of it, and we've had the appropriate rollbacks as have other States.

But we received $150,000 of the $500,000 to work with two high-tech businesses in our area, hoping to increase the economic base of the area. The more legs we have on our economic chair in this country, the better off we're going to be.

I was very concerned—the other evening, I was listening to Lester Thoreau on C-SPAN, the Dean at MIT Business School, talking about the fact that we have no technical or vocationally-trained people in the United States. Where would you send somebody to get high-tech training nowadays? Most people don't even know the answer to that.

I don't know if we can live as a national service economy. It's what we are moving toward. But, Mr. Chairman, we are so much better off producing 747s and selling them than we are chocolate-chip cookies.

Mr. BOUCHER. Dr. Snyder?

Dr. SNYDER. Our source of funds is primarily the State general appropriation and the tuition appropriation that supports all of the other programs. We have a much more expensive program in the technologies but very little differentiation.

We are also able to pick up some support through occasional ARC grants and through working with the Consortium for Manufacturing Competitiveness. But the answer in many cases is that the funds simply are not there to buy the equipment and to provide the training for our faculty.

Mr. BOUCHER. Dr. Israel?

Dr. ISRAEL. In Illinois, we have a line item from the Illinois Community College Board that funds the 50 colleges in advanced technology. We have put approximately $4 million into that line item. We have economic development grants that are approximately $3 million, again, for a system.

The 361,000 students I was talking about are just credit students. We serve nearly a million students through adult education, continuing education, and so forth.

The money that we do put in is just woefully inadequate to try to have the colleges keep pace with technology. We have several of the colleges, the College of DuPage and Rock Valley College in Rockford, that have advanced technology centers right now, but again, an enormous amount of people are trying to take advantage of it, both business and industry, that give some money to upgrade.

We have so many competing needs in Illinois, to meet the needs of dropouts and adult education students, and baccalaureate transfers, special populations—and I can go on and on—and with the shortfall in State revenues, we see a declining share going toward advanced technology and economic development grants. That's why, again, this legislation at the Federal level would really be able to put together some of the hearings that we've had in Illinois into place as far as technology.

Mr. BOUCHER. Assuming that the Federal Government does play a larger role in helping to fund technology training programs, what kind of magnitude of increase in student participation and in terms of actual money expenditures could you anticipate at your community colleges? Let's suppose that we enact Mr. Price's legislation. How many more students are we going to be able to serve with technology education at your colleges, and how much more money in terms of a percentage increase over what is devoted in total to it today, given all funding sources, would you anticipate?

Dr. Gianini?

Dr. GIANINI. That's a good question, and let me try to answer it.

I can't give you actual numbers. What I can tell you is that, of the 60,000 students we have, over 30,000 are those who are already employed and who are coming back to school for retraining in a new profession or upgrading in their current one.

When we work with companies such as Martin Marietta, it has been a partnership with both of us giving, both of us receiving. I can't put a figure on it.

I can tell you that the development of high-tech industry in our area, which is known affectionately as the Silicon Swamp, can grow. At the Research Parks at the University of Central Florida, whom we work with closely, new companies are moving in all the time.

I think we could easily, easily double the number of students that we have in those programs, but let me tell you it's a small number now. It is not a large number.

I think it is going to be a continuum and it's going to be a process, not a quick fix. I would hope that this legislation is not looked upon as a quick fix or a band-aid.

We need to start with our Tech Prep all the way through, and make training in these areas a lifelong process. Please don't look at this as just a piece of a package. Look at it as a continuum. We need legislation that will help us through the entire span.

Mr. BOUCHER. Dr. Snyder?

Dr. SNYDER. I think the number of students will gradually increase whether or not we have higher quality programs. So I think the key is not: can we get more people into the program? I think the answer to that is yes, whether or not we try a lot. But what kind of quality program are we going to have and will it address the technologies that are now being used in our businesses and industries?

Mr. **Boucher**. Dr. Israel?

Dr. **Israel**. A different approach—I think it would affect all our students. I really believe that this legislation can be a focal point in encouraging and moving some demonstration examples to make technology inter- disciplinary so that no one would leave our institutions with an associate degree that didn't have a good understanding of technology.

I see our country and our world just getting much, much more technological. In English classes now—we don't call them English classes; we call them technical communications classes—they have to understand desktop publishing. They are doing their research papers off the computer. They are using grammatics—everything is becoming technological.

I believe it should be inter-disciplinary, and I think it would affect all of our students.

Mr. **Boucher**. Dr. Gianini?

Dr. **Gianini**. Mr. Chairman, if I may add one other thought—80 percent of the Nation's teachers come through community colleges. That is where they start their careers. It is important to us that we have faculty that have the opportunity to use the monies contained in this legislation for faculty development.

On the other end of the continuum, we also have an aging faculty. We know the figures about how many are going to retire in the next few years, and they can't be replaced easily at all.

We need to make sure that the faculty we have in place is on the cutting edge of the technologies. We can't be teaching outdated technology—and I am concerned about that.

Mr. **Boucher**. Thank you very much for those responses.

I don't want to leave out our industry representatives, so let me pose this final question that I have to each of our panelists today.

Looking specifically at the legislation, tell me this. Are we targeting the right issues? Is it properly focused? I have heard one very constructive idea from Dr. Snyder already that we ought to examine closely the matching grant requirements because they could have the effect of penalizing the less financially fortunate parts of the country where the funds to make those matches may perhaps not be available.

What other specific items should we add to this bill or delete from this bill in order to make it most effective and have it best meet its intended targets?

Mr. Ellison?

Mr. **Ellison**. I believe that the management of the entire system, instead of the process—instead of having a curriculum that's successful in 10 or 20 different sites, faculty trained in however many different sites, and facilities in certain areas, until we start looking at a meritocracy of the management—in other words, measuring how successful we are with the result instead of the success of the individual elements—then I don't think we are going to have a successful activity.

I think that you have mentioned a few of them. I have heard mentioned in the testimony today a number of the demonstration grants where curriculum was developed. I know that SemiTOP was one of those. The continuation funding was not achieved and therefore we have wasted those resources and those monies in training that faculty. Unless they are able to use it, they will lose those skills. Unless we are able to use that curriculum, it is not going to put out the trained work force for U.S. advanced technology.

Unless we build those facilities, we are not going to have a place to put the equipment that industry wants to donate, so we need to look at the entire picture and start getting results instead of little elements.

Mr. BOUCHER. Thank you.

Mr. Groseclose?

Mr. GROSECLOSE. The statistic was given earlier that 85 percent of the work force in the year 2000 is working today, so the issue to me specifically becomes reeducating the work force. Let me give two examples that I think are clear signals of how the components in this legislation can be effective. Those two components are partnerships between two-year institutions and industry and centers of excellence.

One of the things that we have developed in Central Florida in conjunction with Valencia Community College and Mid-Florida Tech, which is a four-year technical institution, is a centers of excellence concept on precision machining. Martin invested about $3.5 million several years ago in a computer numerical-controlled machining center in our own training center. The two educational institutions have basic machining equipment in their institutions.

So, we were able to capitalize on wise investment strategy for both parties without duplicating. Our employees go through their basic skills training. Their students go through our advanced training in CNC machining and CNC machine programing.

That is an idea of how a center of excellence concept can work. And I believe that is one of the critical things that this legislation addresses—how that can be beneficial.

The second is partnership. Clearly, that is a partnership as well, but we, over the last two years, have trained a tenth of our work force through Valencia Community College on CATEO, which is an engineering computer system that we are installing.

The spill-over benefits have been tremendous to both of us in terms of equipment, resource sharing, and us getting a significantly upgraded work force technologically. I am about to talk to one of Dr. Gianini's people about a program for a computer system called Product Definition System that we are just entering into that will touch half of our Central Florida work force over the next two years. I am sure we'll enter into a similar partnership for that.

So, if the legislation contained nothing other than a focus on those two items, I believe it would be significant in the needs it will meet in the workplace, which to me is the only reason to do anything like this—if it meets a need.

Mr. BOUCHER. Thank you, Mr. Groseclose.

Dr. Snyder?

Dr. SNYDER. One other thing is that it does call for a National Advisory Committee, and I would want to ensure that both large and small businesses were involved in that. I would suggest that there be a parallel local advisory committee so that the centers selected would have that kind of feedback to keep themselves in line with local needs.

Mr. Boucher. Thank you; that is duly noted.

Dr. Gianini?

Dr. Gianini. Thank you very much for recognizing the viability of America's system of community colleges. They were all started by communities because they were needed there, and I think that they are a key ingredient to solving a national problem in terms of a technologically well-trained work force. So, thank you for your efforts.

Mr. Boucher. Thank you.

The Chair will now recognize the gentleman from Illinois, Mr. Fawell.

Mr. Fawell. Thank you, Mr. Chairman. I am sorry I haven't been able to be here for all of the testimony. I think one could come to the conclusion that, while not having thought about it very much, that we would get more bang for the buck, so to speak, if we did turn our attention more to the community colleges.

I was very interested, Dr. Israel, when you said that 15 percent of the students already have a baccalaureate degree in the Illinois community college system. I don't think many people realize that. Is that generally true in other States?

Dr. Snyder. There are a number of reverse transfers, as we call them, who come back from the four-year institutions to add to their knowledge some skills that they can apply to their work.

Dr. Israel. Congressman Fawell, last year in Illinois we had not only 4,700 reverse transfers—we categorize that at the Illinois Community College Board differently than the people who already have a baccalaureate degree. So we see more and more students coming back.

Seventy percent of our students are taking 6.1 credits or less, so they are part-time students, working in the field already, have a degree or have partial college, coming back to finish their degree. We see in Illinois at least—and I'll defer to Dr. Gianini on Florida—in Illinois, we see that this is a growing trend.

Dr. Gianini. The same trend is evident really throughout the Southeast and, I think, most of the Nation. Many people who receive training at the collegiate level have found now that, either their jobs have changed so dramatically that they need more formal training or they are upgrading and trying to do more with their lives, and they have found that community college is a place where you can take courses and then get a job.

Mr. Fawell. And that's true in an area such as the western Chicago land area, Dr. Israel?

Dr. Israel. Yes; absolutely. What we're doing right now, Congressman Fawell, as you well know, is that there is an underserved committee for the whole State because what we're trying to do is use the community colleges as a delivery distribution point for individuals who are trying to obtain a master's or a doctorate degree.

If you look at the community colleges in Illinois or in the Nation, we are great distribution points because we're all over the place and we're under-capitalized. Someone should buy us out. We're almost like a Wal-Mart.

We are great, low-cost. We are quality. We're meeting the needs of the communities, and we're great distribution points. The problem is that we are under-capitalized and we need some more capital to do this training.

Mr. **Fawell**. When one realizes also that, there, you have the greatest opportunity to serve minorities and those who are obviously seeking and trying to improve themselves, I think that is an added dimension with traditional four-year college tuitions going up so very fast.

I know, again, in DuPage County, the College of DuPage—I can recall when I was in the Illinois Legislature and the Community College Act was passed. Now, I think the number of students at the College of DuPage is close to 30,000, perhaps 26,000 or 27,000. There, it certainly is serving a tremendous need.

Let me ask you this. I didn't expect any one of you to say that you were against this legislation and did not favor more Federal funds flowing to the community colleges. And I know, Dr. Groseclose, that you did make some references to this.

If you had the single most important area where you would want to utilize these kinds of funds, where would it be? The top priority as far as you see that for Federal funds?

Dr. **Snyder**. I would place it where this legislation places it, in technology education.

Mr. **Fawell**. I guess I was speaking specifically at your community college, for instance, within high-tech. What would you do with the money specifically?

Dr. **Snyder**. The particular field?

Mr. **Fawell**. Yes.

Dr. **Snyder**. Ours would be in electronics and in drafting and design and in manufacturing technology—those three areas.

Mr. **Fawell**. I guess what I'm referring to is whether or not you would be trying to beef up your work with secondary schools, for instance, or with the four-year institutions— in those areas, also.

Dr. **Snyder**. Well, we would be using it for that. I think it's a good efficiency to have those relationships and to have them solidly built. That doesn't take a lot of money. It takes something. You know, you have to have something to take to the table.

But the relationship with private industry and the advisory councils are important as well, so we need all of those contacts.

Dr. **Gianini**. I would reinforce what Dr. Snyder has said. The engineering technologies, especially CIM, would be an area that we would look at very early in the stages.

In terms of articulation with the high schools and with the universities, you should be aware that in Florida—and it is the only State in the Nation where someone who graduates from a community college is guaranteed a spot in a State university. It is the only State in the Union.

In terms of working with the secondary school districts, however, it is an ongoing process and a very close one. We do this for several reasons.

Number one is that we believe that the taxpayer who is funding all three institutions should have as effective and efficient a system as possible for its products, namely the students, to go through, and have maximum accountability of the funds. Number two, it is so much better in terms of retaining students if we can bridge those— I think the word seamless was used before—make education a seamless product from K - 12 through the community college and, if they wish to, the university.

I think it was also stated here: there aren't going to be many jobs for holders of high school diplomas, and there will be none for dropouts. So, I think we need to address the whole continuum of education and look at this particular legislation as one catalyst that will help us in that quest.

Dr. ISRAEL. I made some remarks before you got here about the inter-disciplinary nature of technology that should probably transcend the entire institution. We'll take the College at DuPage as an example.

That is an economic development corridor. It's a high- tech corridor. It is very, very critical that we continue in the College at DuPage—which is a leader by the way in the Nation and was so noted years ago in a book. It's one of the best community colleges in the country—that we keep abreast of this technology and that, hopefully, one day we can be as fortunate as Florida and have good articulation with the universities, especially in the areas of technology and the environment.

I had the opportunity four years ago to create the first hazardous waste program in the country. One of the biggest problems was articulating that technological program with universities that didn't even have the program. There was no place to articulate it with, yet, EPA and DOE mandated for certain managerial positions that you already have a master's degree.

What did we do? We re-tooled Ph.D.s and masters and put them through the community colleges to get a degree in hazardous waste technology. Again, articulation and how we work with the university becomes an important part of this legislation. This seamless curriculum, I think, is critical for our country.

Mr. FAWELL. One last point. I noted, Dr. Israel, that you referred to a principles of technology course should be a part of our educational institutions' basic curriculum. Is anybody doing that?

Dr. ISRAEL. Not in Illinois. Again, the legislation, as Mr. Groseclose talked about, is a key focal point. I think if we had these centers of excellence, it would allow us to concentrate on developing the appropriate type of technology core that belongs in our undergraduate institutions, and I look forward for that involvement and help in doing that.

Mr. FAWELL. Thank you very much, and thank you, Mr. Chairman.

Mr. BOUCHER. The Chair thanks the gentleman and recognizes the gentleman from Florida, Mr. Bacchus.

Mr. BACCHUS. Thank you, Mr. Chairman. Thank you for calling this hearing. Let me apologize for my absence and for the fact that I will be hurrying away in a minute.

I have the pleasure and privilege of also serving on the Banking Committee—

[Laughter.]

Mr. **Boucher**. We argued about that committee's activities this morning.

Mr. **Bacchus**. We are downstairs in still another markup of still another banking reform bill. You will be happy to hear that we have completed that process and have proceeded to the markup of still another Resolution Trust Corporation funding bill. All in all, I'd rather be here.

[Laughter.]

Mr. **Bacchus**. I did want especially to stop by to welcome my friend from my district, Dr. Paul Gianini, and ask a few questions about Mr. Price's legislation, of which I am a co-sponsor.

I strongly believe it's necessary. Yet, Dr. Williams has testified once again that the National Science Foundation opposes that particular bill. He says that even as revised, "It is not necessary given our existing authority and because of its narrow focus."

What we've heard Dr. Williams saying in part is that they can already do these things, so why should we have a law that tells them to do them? What we heard in previous testimony was, in my view, an apprehension that, in telling them to do these things, we wouldn't give them the money to do the other things that they need to do. I think that's their real concern.

I would like to ask you, Dr. Gianini, if you have any firsthand experience in trying to get a grant or cooperation from the National Science Foundation on something that is contemplated in the Price bill for which they say that have existing authority but in which you did not receive that cooperation.

Dr. **Gianini**. Mr. Chairman, I can think of two examples, and I would certainly agree with you that the National Science Foundation does have the authority to assist community colleges now, but they don't. I mean you can look at the statistics on what is spent for 40 percent of the students in America's higher educational institutions, and it isn't nearly 40 percent.

I can think of two examples that we tried to work with NSF and followed their guidelines and yet, were refused. We wanted to work with the University of Central Florida to work on introductory science courses to strengthen them and put technological components in them so as to indeed make our students aware of what was happening in the workaday world, to try to simulate what was going on outside of the ivory towers and have students become more aware of what was going on.

Mr. **Bacchus**. And this is something that is specifically encouraged in Congressman Price's bill.

Dr. **Gianini**. Right; that is correct. And we wanted to improve our students' performance, especially when they transferred to the University of Central Florida. This is important. This is part of our quality control.

But we were told that our proposal was too educational. That was a reader's comment. Yet, that was specifically noted as one of the guidelines in the NSF proposals, so we followed the guidelines and lost.

Another one I can think of—and I think this is something that could be fixed. I question how many readers there are with any type of community college background at NSF.

We submitted a physics proposal for a piece of equipment to study sunspot activity. One of the readers' comments was that the experiments proposed were not appropriate for community college students or faculty—or faculty. Amazing to me.

I don't know where one does study sunspot activity in the course of their formal career. I would think throughout it. It is certainly a magnificent scientific area.

Mr. BACCHUS. If I might interject, Valencia Community College serves an area of Central Florida which includes many people who work at the Kennedy Space Center who have been intimately involved in the space program over decades. That includes a number of the faculty members at Valencia.

Dr. GIANINI. That is correct.

We tried to work on a small grant in terms of photography to work with NASA. We were again refused. Really, we couldn't figure out why.

We try to read the readers' comments. We try to strengthen our proposals, but basically, when we bang on the door, nobody's home.

Mr. BACCHUS. These seem to me to be two good examples of why we need to pass Mr. Price's bill.

Again, let me apologize for my brevity in my appearance here. I congratulate Dr. Gianini and the other witnesses on their testimony.

As the Chairman and other members will attest, from my arrival here the first of this year, I have constantly, constantly encouraged the National Science Foundation to look to community colleges and provide them with more opportunities and more funds. I will continue to do so.

Thank you, Mr. Chairman.

Mr. BOUCHER. Thank you.

The Chair thanks the gentleman and expresses once again the subcommittee's thanks to this panel of witnesses and in fact to all of our witnesses who testified this morning. Your information is very helpful to us.

We will leave the record of this hearing open for an additional two weeks, during which period, I would invite any of the panel members or others who have testified here this morning to submit any additional recommendations that they may have for how this legislation might be better fine-tuned to meet its purposes. Any recommendations that you have directed toward that goal would be most welcome indeed.

There being no further business to come before the subcommittee, it now stands adjourned.

[Whereupon, at 11:45 a.m., the subcommittee adjourned, to reconvene at the call of the Chair.]

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SUBCOMMITTEE MARKUP OF H.R. 2936, THE SCIENTIFIC AND TECHNICAL EDUCATION ACT OF 1992

WEDNESDAY, MARCH 18, 1992

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
SUBCOMMITTEE ON SCIENCE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:40 a.m. in room 2318, Rayburn House Office Building, Hon. Rick Boucher [chairman of the subcommittee] presiding.

Mr. BOUCHER. The Subcommittee on Science will come to order.

This morning the subcommittee is marking up H.R. 2936, the Technical Training and Education of 1992, legislation introduced by our North Carolina colleague, Mr. Price.

The bill is designed to address one of our most important priorities in science education, the need to strengthen and improve education in advanced technology fields at our Nation's community colleges.

I am going to include the rest of these prepared remarks in the record this morning, containing a detailed explanation of the measures that are within the amendment in the nature of a substitute that very shortly will be considered by the subcommittee.

[The prepared statement of Mr. Boucher, plus a copy of H.R. 2936 follow:]

OPENING STATEMENT
BY THE
HONORABLE RICK BOUCHER, (D-VA)
ON
H.R. 2936, THE TECHNICAL TRAINING AND EDUCATION ACT OF 1992 MARK-UP

MARCH 18, 1992

This morning, the Subcommittee on Science is marking up H.R. 2936, the "Technical Training and Education Act of 1992." This legislation is sponsored by my colleague, the gentleman from North Carolina, Mr. Price. The bill is designed to address one of our most important priorities in science education: the need to strengthen and improve education in advanced technology fields at our nation's community colleges. Two year colleges are the fastest growing segment of higher education. There are over 1300 community colleges in America, more than twice as many as existed just thirty years ago. The most recently available data indicate that 41% of all full-time college freshmen and sophomores attend two-year colleges. Because of the rapidly increasing importance of two-year colleges in American education, it is essential that science and technology programs at these colleges receive greater assistance from the National Science Foundation.

The amendment in the nature of a substitute before us today addresses the major areas of need in science education at two-year colleges through competitive grant programs emphasizing the NSF's traditional role in developing model curricula, disseminating instructional materials, enhancing faculty development, and stimulating partnerships between educational institutions and industry.

On November 19, 1991, the Subcommittee on Science held a hearing on H.R. 2936, introduced by Congressman Price and H.R. 3606, a bill with similar objectives introduced by Congressman Hoagland. Since that time, Members and staff of the Subcommittee have worked to develop a consensus which is reflected in the amendment. Before recognizing the gentleman from California, I would like to express my gratitude to the gentleman from North Carolina, Mr. Price, and his staff for their numerous contributions to the amendment we are considering today, and to the gentleman from Nebraska, Mr. Hoagland, and his staff for their valuable contributions.

That concludes the chair's opening statement, and the chair is now pleased to recognize the ranking Republican Member of this Subcommittee, the gentleman from California, Mr. Packard.

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102D CONGRESS
1ST SESSION

H. R. 2936

To establish programs at the National Science Foundation for the advancement of technical education and training in advanced-technology occupations, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

JULY 17, 1991

Mr. **PRICE** (for himself, Mr. **BROWN**, Mr. **BOUCHER**, Mr. **VALENTINE**, Mr. **BOEHLERT**, Mr. **LEWIS** of Florida, Mr. **ROGERS**, Mr. **BROWDER**, Mr. **ESPY**, Mr. **FROST**, Mr. **JONES** of North Carolina, Ms. **KAPTUR**, Mr. **LANCASTER**, Mr. **PERKINS**, Mr. **ROE**, Mr. **SAWYER**, Ms. **SLAUGHTER** of New York, and Mr. **TOWNS**) introduced the following bill; which was referred jointly to the Committees on Science, Space, and Technology and Education and Labor

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A BILL

To establish programs at the National Science Foundation for the advancement of technical education and training in advanced-technology occupations, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "Technical Education and Training Act of 1991".

SEC. 2. FINDINGS.

The Congress finds that—

(1) the United States is at a disadvantage in the competitive global economy because our workforce is ill-trained for the technologically advanced modern workplace;

(2) our position in the world economy faces ever greater challenges from highly trained foreign competition and will be further undermined as the ratio of active American workers to retirees continues to fall;

(3) the United States increasing dependence on foreign producers for advanced-technology products threatens not only our economic independence, but our national security as well;

(4) the improvement of our workforce's productivity and our international economic position depend upon the substantial upgrading and coordination of our educational efforts in science, mathematics, and technology, especially at the associate-degree level;

(5) efforts to address the shortages of technically trained workers in a wide variety of fields demands a national strategy to intensify collaboration among the Nation's associate-degree granting col-

leges, private industry, and labor to train skilled, advanced technicians; and

(6) the National Science Foundation's traditional role in developing model curricula, disseminating instructional materials, enhancing faculty development, and stimulating partnerships between educational institutions and industry, makes an enlarged role for the National Science Foundation in technical education and training particularly appropriate.

SEC. 3. TECHNICAL EDUCATION AND TRAINING.

(a) NATIONAL ADVANCED TECHNICAL EDUCATION AND TRAINING PROGRAM.—(1) The Director of the National Science Foundation (hereafter in this Act referred to as the "Director") shall carry out an advanced technical education and training program under which accredited associate-degree-granting colleges, using matching non-Federal funds, will provide educational training in technical competencies in strategic fields. Such program shall include emphasis on collaborative programs with local employers and technical occupational training and shall place emphasis on attracting men and women to the program who are nontraditional students who desire to upgrade or acquire new and advanced occupational skills, and persons who have recently completed high school or who left high school prior to graduation. The program shall establish, strengthen, and expand the technical education and training capabilities of associate-degree-granting colleges through—

(A) the development of associate degree and training programs in advanced-technology occupations by accredited associate-degree-granting colleges, and by consortia of such colleges, with particular emphasis on model instructional programs to prepare and upgrade technicians and to retrain other workers in state-of-the-art competencies in advanced-technology occupations;

(B) the development in such colleges of faculty and instructors, both full- and part-time, in advanced-technology fields such as laser technology, electronics, robotic technology, nuclear technology, computer technology, and fiber optics, advanced manufacturing technology, advanced health technologies, and in advanced-technology applications that integrate and synthesize emerging and existing technologies;

(C) the establishment of innovative partnership arrangements among associate-degree-granting colleges, the private sector, and the government to enhance the exchange of technical and scientific personnel, including programs providing faculty opportunities to have short-term assignments with industry;

(D) the development of cooperative advanced technical education and training programs with business, industry, labor, and government;

(E) the purchase or lease of state-of-the-art instrumentation essential to training and education programs designed to prepare and upgrade technicians in advanced-technology fields;

(F) the stimulation of private sector participation in advanced technical education and training programs in associate-degree-granting colleges through the sharing of program costs, equipment loans, and donations, and the cooperative use of laboratories, plants, and other facilities as training sites, and provision for relevant state-of-the-art work experience opportunities for students enrolled in such programs; and

(G) the development and dissemination of instructional materials in support of advanced technical education and training programs in associate-degree-granting colleges.

(2) In carrying out the national advanced technical education and training program, the Director shall—

(A) award grants on a competitive basis to accredited associate-degree-granting colleges which demonstrate the ability to provide competency-based technical training; and

(B) work with the Nation's network of associate-degree-granting colleges to establish and maintain, at the National Science Foundation or by contract, a readily accessible inventory of advanced technical education and training programs which are serving public and private employers and addressing the changing workforce demands of technology.

(3) Each college awarded a grant under this subsection shall provide an associate degree training program in designated advanced-technology occupational fields in accordance with the provisions of this section.

(4) No grant awarded under this subsection shall exceed $500,000 per year.

(5) To ensure that the national advanced technical education and training program is consistent with the needs of industries, the Director shall appoint a 15-member National Advisory Council on Advanced Technical Education and Training (hereafter in this section referred to as the "Council"), which shall have the responsibility of advising the Director on the goals and implementation of the program, reviewing the effectiveness of the pro-

gram, and reporting annually to the Director and the Congress. The Council shall include representatives of industry, labor, associate-degree-granting colleges, the military, and economic development organizations. The chairman of the Council shall be a president or governing board chairman of an associate-degree-granting college.

(6) The Council shall prepare and submit to the National Science Foundation, and directly to the Congress without review by the National Science Foundation or the Office of Management and Budget, an annual report on the national advanced technical education and training program under this subsection, together with—

(A) a review and evaluation of the effectiveness of the program;

(B) a catalog of the associate-degree-granting college programs identified by the inventory required under paragraph (2)(B);

(C) a recommendation on the feasibility of expanding the program; and

(D) such other recommendations, including recommendations for legislation, as the Council and the Director consider necessary.

(7) In carrying out this subsection, the Director shall consult, cooperate, and coordinate with the programs and policies of the Department of Commerce and other rele-

vant Federal agencies including the Departments of Labor, Education, and Defense.

(8) The national advanced technical education and training program shall give emphasis to training programs described in paragraph (3) which—

(A) include flexibility in scheduling in order to accommodate working people and parents; and

(B) take steps to meet the adaptive and training needs of handicapped young people and adults.

(b) NATIONAL CENTERS OF TECHNICAL EDUCATION AND TRAINING.—(1) The Director shall designate 10 centers of excellence among associate-degree-granting colleges. Five such centers shall be associate-degree-granting with exceptional programs of advanced technical education and training, which will serve as national and regional clearinghouses for the benefit of other colleges that are striving to upgrade their technical education programs. Five such centers shall be other associate-degree-granting colleges that excel in undergraduate education in mathematics and science, which shall serve as national and regional clearinghouses for the benefit of both colleges and secondary schools that are striving to upgrade mathematics and science courses. Centers designated under this paragraph shall be geographically distributed and chosen by a competitive application process from among colleges that will provide operating resources, in cash or in kind, equal in value to the amount of the Federal grants made under this paragraph.

(2) The Director shall make no fewer than 20 grants annually, to associate-degree-granting colleges for the purpose of developing and strengthening partnerships in mathematics and science education with secondary schools in the community served by the college. These grants shall be made by a competitive application process from among colleges that will provide operating resources, in cash or in kind, equal in value to the amount of the Federal grants made under this paragraph. No grant made to a college under this paragraph shall exceed $500,000.

(c) DEFINITIONS.—As used in this section—

(1) the term "advanced-technology" includes or refers to advanced technical activities such as the modernization, miniaturization, integration, and computerization of electronic, hydraulic, pneumatic, laser, nuclear, chemical, telecommunication, and other technological applications to enhance productivity improvements in manufacturing, communication, transportation, commercial, and similar economic and national security activities; and

(2) the term "associate-degree-granting college" means a regionally-accredited postsecondary educa-

tional institution that has authority to award an associate degree or comparable technical certificate and has the mission of offering comprehensive education and training services to meet the needs of a prescribed community, including a two-year junior college, community college, technical institute, or other postsecondary institution offering comprehensive associate-degree programs in technical fields.

(d) ASSOCIATE-DEGREE-GRANTING COLLEGE/UNIVERSITY PARTNERSHIP.—

(1) OUTREACH GRANTS.—(A) The Director shall make outreach grants to associate-degree-granting colleges to enable such colleges to negotiate the establishment of partnerships with 4-year academic institutions.

(B) No grant awarded under this paragraph may exceed $25,000.

(2) PARTNERSHIP GRANTS.—(A) The Director shall make grants to eligible partnerships to assist associate-degree-granting colleges and 4-year academic institutions in helping students to transition from associate-degree-granting colleges to 4-year academic institutions to enable such students to achieve bachelor degrees in mathematics, science, engineering, or technology.

(B) Grants made under this paragraph shall be awarded on a competitive, merit basis.

(C) Grants made under this paragraph shall be for a period of 1 year, and are renewable for a period not to exceed 5 years.

(D) Each eligible partnership receiving a grant under this paragraph shall—

(i) examine the associate-degree-granting college's curriculum to ensure that academic credit earned at the associate-degree-granting college will be transferable to the 4-year academic institution or institutions;

(ii) brief teachers from the associate-degree-granting college on the specific requirements of courses at the 4-year academic institution or institutions when necessary to facilitate curriculum compatibility between the institutions;

(iii) facilitate the admittance and expedite academic credit transfers of students matriculating from the associate-degree-granting college to the 4-year academic institution or institutions;

(iv) provide special counseling for students to encourage and facilitate student transfers from the associate-degree-granting college to the 4-year academic institution or institutions, including counseling targeted at women and minority students;

(v) conduct workshops at the associate-degree-granting college to acquaint students with the opportunities, requirements, and available financial aid of the 4-year academic institution or institutions;

(vi) provide special tours and orientation visits to the facilities of the 4-year academic institution or institutions for students from the associate-degree-granting college, including the opportunity to observe laboratory demonstrations and experiments, and experience hands-on interaction with equipment and instrumentation;

(vii) provide special summer programs for students from the associate-degree-granting college to encourage such students' subsequent matriculation at the 4-year academic institution or institutions; and

(viii) provide special ongoing counseling for any graduates of the associate-degree-granting college who have matriculated at the 4-year academic institution or institutions.

(3) GEOGRAPHIC DISTRIBUTION.—In awarding grants under this subsection, the Director shall ensure an equitable geographic distribution of such grants.

(4) APPLICATION.—Each associate-degree-granting college or eligible partnership desiring a grant under this subsection shall submit an application to the Director at such time, in such manner, and accompanied by such information, as the Director may reasonably request.

(5) DEFINITIONS.—As used in this subsection—

(A) the term "4-year academic institutions" means colleges, universities, and institutes of technology that award bachelor degrees in mathematics, science, or engineering, or a 4-year technology degree; and

(B) the term "eligible partnership" means an associate-degree-granting college in partnership with at least one but not more than four 4-year academic institutions.

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Mr. BOUCHER. Let me simply add that we have worked very diligently and in the best of cooperative manners with the minority of this subcommittee, and particularly the gentleman from California, Mr. Packard, as we have structured the provisions of this legislation. I want to thank and commend Mr. Packard and his colleagues on the Republican side of this committee for their very excellent work.

I also want to commend Mr. Hoagland, who is in the audience today and is a sponsor of a bill that is very similar to that introduced by our colleague, Mr. Price. We have incorporated in this measure aspects of Mr. Hoagland's legislation, as well.

So as the bill moves forward, the two major contributors to this effort, I think we can say with confidence, are Mr. Price and Mr. Hoagland.

That concludes the opening remarks of the Chair, and I will be pleased to recognize at this time the ranking Republican member of the subcommittee, the gentleman from California, Mr. Packard.

Mr. PACKARD. Thank you very much, Mr. Chairman. I appreciate those kind words. We do cooperate, and have, on this piece of legislation, and I think it has worked out to the benefit of the quality of this legislation.

Two-year colleges play a very intricate role in the education of this Nation's undergraduates. These colleges serve as a critical link in the pipeline which educates future scientists and engineers. While we realize the excellent contribution that two-year colleges make to this Nation, we must also realize that there are opportunities for improvements, particularly in the area of curriculum development and faculty enhancement.

It is against this backdrop that we mark up H.R. 2936, a bill introduced by Mr. Price. This bill seeks to improve the quality and effectiveness of scientific and technical education at two-year and community colleges.

I would like to thank Mr. Price; Mr. Boucher, as our Chairman; and Mr. Walker, the ranking Republican of this committee, for their efforts to work toward this bill that will promote the goals I have mentioned and also fit well within the mission of the National Science Foundation.

Based on the agreement that we have worked out between us all, we will be including language in the subcommittee report clearly stating that these programs will not cut into the budget of existing undergraduate programs. It is also important to me that this bill is fiscally responsible, since no new money is being authorized.

Mr. Chairman, again I thank you for your assistance and leadership in helping to mark this bill up, and I am very happy to cosponsor H.R. 2936.

[The prepared statement of Mr. Packard follows:]

STATEMENT OF
THE HONORABLE RON PACKARD
SCIENCE SUBCOMMITTEE
MARKUP OF H.R. 2936
9:30 A.M., 2318 RHOB
MARCH 18, 1992

Two-year colleges play an intricate role in the education of this nation's undergraduates. These colleges serve as critical links in the "pipeline" which educates future scientists and engineers. While realizing the excellent contribution that two-year colleges make to this nation, we must also realize that there are opportunities for improvement, particularly in the areas of curricula development and faculty enhancement.

It is against this backdrop that we markup HR 2936, a bill introduced by Mr. Price. This bill seeks to improve the quality and effectiveness of scientific and technical education at two-year and community colleges.

I would like to thank Mr. Price, Chairman Boucher, and Mr. Walker -- the Ranking Republican of this Committee -- for their efforts to work towards a bill that will promote the goals I have mentioned and will also fit well within the mission of the National Science Foundation.

Based on the agreement that was worked out between all of us, we will be including language in the Subcommittee report clearly stating that these programs will not cut into the budget of existing undergraduate programs. It is also important to me that this bill is fiscally responsible since no new money is being authorized.

Mr. Chairman, given the changes that were made in the original bill which are represented in the markup vehicle before us today, I am happy to cosponsor HR 2936.

Mr. **Boucher**. Thank you very much, Mr. Packard.

The gentleman from Indiana, Mr. Roemer?

Mr. **Roemer**. Mr. Chairman, I will be very, very brief.

I, too, would like to join in both of your eloquent words about our colleague, Mr. Hoagland from Nebraska, who has worked very, very diligently on this piece of legislation, and as a member of the Education and Labor Committee, I look forward to working with him as this is referred to our committee. It is filling in an important area where there needs to be additional work in community colleges in technical training.

As a member of the Education and Labor Committee I also attended a hearing down in North Carolina for Mr. Price, who has also worked very hard on this legislation in crafting the details, and I look forward to continuing to work with both of my colleagues, who have put together an excellent piece of legislation.

Thank you, Mr. Chairman.

Mr. **Boucher**. The gentleman from New York, Mr. Boehlert?

Mr. **Boehlert**. Mr. Chairman, this is a good bill for a whole lot of very valid reasons that I proudly identify with. I urge us to move expeditiously.

Mr. **Boucher**. The Chair thanks the gentleman.

Mr. **Packard**. Mr. Chairman, with your permission—

Mr. **Boucher**. Yes, the gentleman from California?

Mr. **Packard**.—I would like to submit Congressman Walker's statement. He had intended to be here.

[The prepared statement of Mr. Walker follows:]

CONGRESSMAN ROBERT S. WALKER (R-PA)
STATEMENT ON H.R. 2936
SCIENCE SUBCOMMITTEE MARK-UP
March 18, 1992

Mr. Chairman:

I'm pleased we were able to reach agreement on this bill. In its current form, H.R. 2936 recognizes both the importance of two-year and community colleges in preparing our youth for today's technological jobs and the proper role of the National Science Foundation in promoting science and mathematics education. In short, the bill acknowledges that community colleges educate a broad range of the nation's students in a wide variety of fields without turning NSF into an arm of the Department of Labor.

In addition, the bill report will alleviate another one of my concerns by making it clear that the community college aid will not come at the expense of the existing undergraduate programs. The bill also ensures that the federal money will not be used as an excuse to cut non-federal support to the colleges. Finally, H.R. 2936 is responsible in its use of existing authorizations to fund this worthwhile initiative.

I want to thank Mr. Price, Chairman Boucher and the Ranking Republican, Mr. Packard, for their long, hard work on this measure. It should result in a more skilled and diverse workforce.

Mr. PACKARD. And perhaps also include a unanimous consent request that all written statements be entered into the record.

Mr. BOUCHER. Without objection, it is so ordered.

[The prepared statement of Mr. Valentine follows:]

MARK-UP STATEMENT

SUBCOMMITTEE ON SCIENCE

THE HONORABLE TIM VALENTINE (D-NC)

MARCH 18, 1992

(PREVIOUSLY H.R. 2936)

Mr. Chairman, I strongly support the legislation before us today, the Amendment to the National Science Foundation authorization Act of 1988 adding the new Title III -- Scientific and Advanced Technology Improvements.

As you know, on October 31st, 1991, the Subcommittee on Technology and Competitiveness marked-up the original version of this bill -- H.R. 2936, the Technical Education and Training Act of 1991, introduced by my good friend and colleague, Mr. David Price.

We continue to hear testimony that we must provide an alternative to underemployment for individuals who choose not to pursue a four year college degree. This legislation is a start towards improving the scientific and technical education for the large number of Americans who want to acquire the skills that will lead to good-paying careers, but who are not pursuing a baccalaureate degree.

Our educational infrastructure must be improved in a way that produces quality graduates who are able to contribute to the high technology work place. I urge my colleagues to support this legislation. The realities of the international economy and global competition require it.

Mr. **Boucher**. The Chair asks unanimous consent that the subcommittee print, which is an amendment in the nature of a substitute, be considered as the subcommittee markup vehicle and original text for the purpose of markup. Without objection, it is so ordered.

[The amendment in the nature of a substitute follows:]

AMENDMENT IN THE NATURE OF A SUBSTITUTE TO H.R. 2936

OFFERED BY MR. BOUCHER

Strike all after the enacting clause and insert in lieu thereof the following:

SECTION 1. SHORT TITLE.

This Act may be cited as the "Scientific and Technical Education Act of 1992".

SEC. 2. FINDINGS.

The Congress finds that—

(1) the position of the United States in the world economy faces great challenges from highly trained foreign competition;

(2) the workforce of the United States must be better prepared for the technologically advanced, competitive, global economy;

(3) the improvement of our work force's productivity and our international economic position depend upon the strengthening of our educational efforts in science, mathematics, and technology, especially at the associate-degree level;

(4) shortages of scientifically and technically trained workers in a wide variety of fields will best be addressed by collaboration among the Nation's associate-degree granting colleges and private industry to produce skilled, advanced technicians; and

(5) the Foundation's traditional role in developing model curricula, disseminating instructional materials, enhancing faculty development, and stimulating partnerships between educational institutions and industry, makes an enlarged role for the Foundation in scientific and technical education and training particularly appropriate.

SEC. 3. SCIENTIFIC AND TECHNICAL EDUCATION.

(a) NATIONAL ADVANCED SCIENTIFIC AND TECHNICAL EDUCATION PROGRAM.—(1) The Director shall carry out a program to assist accredited associate-degree-granting colleges, and consortia thereof, to provide education in advanced-technology fields. The program shall place emphasis on the needs of nontraditional students. It shall be designed to strengthen and expand the scientific and technical education and training capabilities of associate-degree-granting colleges through such methods as—

(A) the development of model instructional programs in advanced-technology fields;

(B) the development of faculty and instructors, both full- and part-time, in advanced-technology fields;

(C) the establishment of innovative partnership arrangements among associate-degree-granting colleges, the private sector, and State and local governments (and, where appropriate, Federal laboratories) including programs providing private sector donations, faculty opportunities to have short-term assignments with industry, sharing of program costs, equipment loans, and the cooperative use of laboratories, plants, and other facilities, and provision for relevant state-of-the-art work experience opportunities for students enrolled in such programs;

(D) the purchase or lease of state-of-the-art instrumentation essential to programs designed to prepare and upgrade students in scientific and advanced-technology fields; and

(E) the development and dissemination of instructional materials in support of improving the advanced scientific and technical education and training capabilities of associate-degree-granting colleges, including programs for nonscience students.

(2) In carrying out this subsection, the Director shall—

(A) award grants on a competitive, merit basis to accredited associate-degree-granting colleges that will make contributions, in cash or in kind, toward the cost of programs funded by such grants; and

(B) establish and maintain a readily accessible inventory of programs which are funded under this subsection.

(b) NATIONAL CENTERS OF SCIENTIFIC AND TECHNICAL EDUCATION.—The Director shall establish centers of excellence, not to exceed 10 in number, among associate-degree-granting colleges. Centers shall meet one or both of the following criteria:

(1) Exceptional programs of advanced technical education.

(2) Excellence in undergraduate education in mathematics and science.

The centers shall serve as national and regional clearinghouses and models for the benefit of both colleges and secondary schools, and shall provide seminars and programs to disseminate model curricula and model teaching methods and instructional materials to other associate-degree granting colleges in the geographic region served by the center. Centers designated under this subsection shall be geographically distributed and chosen by a competitive, merit-based application process from among colleges that will make contributions, in cash or in kind, toward the cost of programs funded by grants made under this subsection.

(c) ARTICULATION PARTNERSHIPS.—

(1) PARTNERSHIP GRANTS.—(A) The Director shall make grants to eligible partnerships to assist students pursuing bachelors degrees in mathematics, science, engineering, or technology to make the transition from associate-degree-granting colleges to bachelor-degree-granting institutions, through such means as—

(i) examining curricula to ensure that academic credit earned at the associate-degree-granting college can be transferred to bachelor-degree-granting institutions;

(ii) informing teachers from the associate-degree-granting college on the specific requirements of courses at the bachelor-degree-granting institution; and

(iii) providing summer programs for students from the associate-degree-granting college to encourage such students' subsequent matriculation at bachelor-degree-granting institutions.

(B) Grants made under this paragraph shall be awarded on a competitive, merit basis.

(C) Each eligible partnership receiving a grant under this paragraph shall make contributions, in cash or in kind, toward the cost of programs funded by such grant. The contributions shall include—

(i) counseling students, including nontraditional students, about the requirements and course offerings of the bachelor-degree-granting-institution; and

(ii) conducting workshops at the associate-degree-granting-college, and conducting special tours and orientation sessions at the bachelor-degree-granting-institution to ensure that students are familiar with programs, including laboratories and financial aid programs, at the bachelor-degree-granting-institution.

(2) OUTREACH GRANTS.—The Director shall make grants to associate-degree-granting colleges to strengthen relationships with secondary schools in the community served by the college by improving mathematics and science education and encouraging the interest and aptitude of secondary school students for careers in science and advanced-technology fields. These grants shall be made through a competitive application process from among colleges that will make contributions, in cash or in kind, toward

the cost of programs funded by grants made under this paragraph.

(3) GEOGRAPHIC DISTRIBUTION.—In awarding grants under this subsection, the Director shall ensure an equitable geographic distribution of such grants.

(d) COORDINATION WITH OTHER FEDERAL DEPARTMENTS.—In carrying out this section, the Director shall consult, cooperate, and coordinate, to enhance program effectiveness and to avoid duplication, with the programs and policies of other relevant Federal agencies.

(e) LIMITATION ON FUNDING.—To qualify for a grant under this section, an associate-degree-granting college, or consortium thereof, shall provide assurances adequate to the Director that [redacted] it will not decrease its level of spending of funds from non-Federal sources on advanced scientific and technical education and training programs.

(f) DEFINITIONS.—As used in this section—

(1) the term "bachelor-degree-granting institutions" means accredited colleges, universities, and institutes of technology that award bachelor degrees in mathematics, science, or engineering, or a 4-year technology degree;

(2) the term "advanced-technology" includes advanced technical activities such as the modernization, miniaturization, integration, and computerization of electronic, hydraulic, pneumatic, laser, nuclear, chemical, telecommunication, fiber optic, robotic, and other technological applications to enhance productivity improvements in manufacturing, communication, transportation, commercial, and similar economic and national security activities;

(3) the term "associate-degree-granting college" means a regionally-accredited postsecondary educational institution that has authority to award an associate degree or comparable technical certificate and has the mission of offering comprehensive education services to meet the needs of a prescribed community, including a 2-year junior college, community college, technical institute, or other postsecondary institution offering comprehensive associate-degree programs in technical fields;

(4) the term "eligible partnership" means one or more associate-degree-granting colleges in partnership with one or more bachelor-degree-granting institutions; and

(5) the term "nontraditional students" means students who have been in the workforce and who

desire to further their education and training in advanced-technology fields.

SEC. 4. ADMINISTRATIVE AMENDMENT.

Section 3 of the National Science Foundation Act of 1950 (42 U.S.C. 1863) is amended by adding at the end the following new subsection:

"(g) In carrying out subsection (a)(4), the Foundation is authorized to foster and support the development and use of computer networks which may be used substantially for purposes in addition to research and education in the sciences and engineering, if the additional uses will tend to increase the overall capabilities of the networks to support such research and education activities.".

SEC. 5. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated, from sums otherwise authorized to be appropriated, to the Director for carrying out this Act—

(1) $35,000,000 for fiscal year 1992; and

(2) $35,000,000 for fiscal year 1993.

Mr. Boucher. And without objection, the amendment in the nature of a substitute will be considered as read and open for amendment at any point.

The Chair would indicate that there is an explanation of the provisions of the amendment in the nature of a substitute before each member. I would, without objection, simply include that explanation in the record. If members have any questions, the Chair would be glad to respond for answers.

[The explanation of the amendment in the nature of a substitute to H.R. 2936 follows:]

Explanation of Amendment

The mark-up vehicle before us for consideration this morning contains several minor drafting changes which were inserted for purposes of clarification. These technical changes have been discussed and cleared with the minority. Additionally, a provision pertaining to the NSF network, which I will momentarily explain, has been added to the mark-up vehicle.

Consistent with the goals of both H.R. 2936 and H.R. 3606, the amendment before us establishes a "National Advanced Scientific and Technical Education Program," which will provide grants to strengthen the scientific and technical education capabilities of associate-degree granting colleges in areas where comparable NSF grants have made proven contributions to undergraduate education.

Another provision establishes "National Centers of Scientific and Technical Education" among two-year colleges. The amendment authorizes NSF to designate as many as ten Centers through a competitive, merit-based application process. Because of concerns expressed by the smaller two-year colleges, we have removed from each of the grant programs the requirement contained in H.R. 2936 for matching funds to be provided as a condition of receiving a grant. The amount of the grantee's contribution is at the discretion of the National Science Foundation. The emphasis in the bill has been refocused from direct support for training programs at two-year colleges to reliance upon traditional NSF methods of improving scientific and technical education.

The consensus reflected in the amendment builds upon initiatives already being undertaken on a small scale by the NSF. It is our intention that the authorization level of $35 million in each of fiscal years 1992 and 1993, from previously authorized funds, will not interfere with the NSF's existing undergraduate programs in math and science. We believe the requested funding level for the National Science Foundation should be adequate to accommodate both the NSF's undergraduate programs and the new initiatives for two-year colleges. I am pleased that we have been able to reach an agreement with the minority on the content of the substitute amendment, and I would like to express my thanks to the gentleman from California, Mr. Packard, and to his fine staff for their cooperation and support, which has enabled us to make the progress represented by today's mark-up.

The mark-up vehicle also includes a provision to correct a problem identified at the Subcommittee's March 12th hearing on the management of the NSFNet. The testimony at the hearing supported dropping an NSF policy which imposes unneeded controls on traffic traveling on the NSFNet backbone. NSF stated that the policy is required by the NSF enabling statute. The mark-up vehicle modifies the NSF Act of 1950 to remove this requirement.

Mr. **Boucher**. I hear no questions.

Are there amendments to the amendment in the nature of a substitute?

Mr. **Packard**. Mr. Chairman?

Mr. **Boucher**. The gentleman from California?

Mr. **Packard**. Mr. Chairman, I simply wish to amend the title. The amendment will read as follows:

"A bill to establish programs at the National Science Foundation to strengthen and improve the scientific and technical education capabilities of associate-degree granting colleges, and for other purposes."

[The amendment offered by Mr. Packard follows:]

AMENDMENT I (MR. PACKARD)

Amend the title of the bill to read:

"A bill to establish programs at the National Science Foundation to strengthen and improve the scientific and technical education capabilities of associate-degree granting colleges, and for other purposes."

Mr. **Boucher**. Is there discussion on the amendment offered by the gentleman from California?

[No response.]

Mr. **Boucher**. The Chair hears none.

The question occurs on the amendment. Those in favor, say aye.

[Chorus of ayes.]

Mr. **Boucher**. Those opposed, no.

[No response.]

Mr. **Boucher**. The ayes have it and the amendment is agreed to.

Are there further amendments to the amendment in the nature of a substitute?

[No response.]

Mr. **Boucher**. The Chair hears none.

The Chair will recognize the gentleman from Indiana.

Mr. **Roemer**. Mr. Chairman, I move adoption of the amendments to H.R. 2936.

Mr. **Boucher**. The question is on the motion of the gentleman. All those in favor will say aye.

[Chorus of ayes.]

Mr. **Boucher**. Those opposed, no.

[No response.]

Mr. **Boucher**. The ayes have it and the motion is agreed to.

The Chair recognizes the gentleman from California.

Mr. **Packard**. Thank you, Mr. Chairman.

To complete this action today, I move that the subcommittee report the bill as amended, and further I move to instruct staff to prepare the subcommittee report and to make any necessary technical and conforming amendments, and that the Chairman take all necessary steps to bring the bill before the full committee for consideration.

Mr. **Boucher**. The question—is there discussion on the motion?

[No response.]

Mr. **Boucher**. The question is on the motion of the gentleman from California. Those in favor will say aye.

[Chorus of ayes.]

Mr. **Boucher**. Those opposed, no.

[No response.]

Mr. **Boucher**. The ayes have it and the motion is agreed to.

There being no further business to come before the subcommittee today, with the thanks of the Chair to the members, this markup session is adjourned.

[Whereupon, at 9:50 a.m., the subcommittee adjourned, to reconvene at the call of the Chair.]

FULL COMMITTEE MARKUP OF H.R. 2936, THE SCIENTIFIC AND TECHNICAL EDUCATION ACT OF 1992

THURSDAY, APRIL 2, 1992

U.S. House of Representatives,
Committee on Science, Space, and Technology,
Washington, D.C.

The committee met, pursuant to recess, at 10:10 a.m. in room 2318, Rayburn House Office Building, Hon. George E. Brown, Jr. [chairman of the committee] presiding.

The **Chairman**. Now we will turn to the Scientific and Technical Education Act of 1992, H.R. 2936.

I think we are all familiar with that legislation. I have a brief opening statement which I will ask to be inserted in the record at this point.

[The prepared statement of Mr. Brown follows:]

OPENING STATEMENT BY THE HONORABLE GEORGE E. BROWN, JR. (D.CA) ON THE MARKUP OF H.R. 2936, THE SCIENTIFIC AND TECHNICAL EDUCATION ACT OF 1992

April 2, 1992

THIS MORNING, THE COMMITTEE WILL CONSIDER H.R. 2936, THE "SCIENTIFIC AND TECHNICAL EDUCATION ACT OF 1992," WHICH WAS REPORTED ON MARCH 18, 1992 BY THE SUBCOMMITTEE ON SCIENCE.

THIS LEGISLATION WAS ORIGINALLY INTRODUCED BY A FORMER MEMBER OF OUR COMMITTEE, THE GENTLEMAN FROM NORTH CAROLINA, MR. PRICE, AND ALSO REFLECTS THE CONTRIBUTIONS OF THE GENTLEMAN FROM NEBRASKA, MR. HOAGLAND, WHO INTRODUCED SIMILAR LEGISLATION. WITHIN OUR

COMMITTEE, H.R. 2936 WAS REFERRED TO THE SUBCOMMITTEE ON SCIENCE AND TO THE SUBCOMMITTEE ON TECHNOLOGY AND COMPETITIVENESS. I WOULD LIKE TO THANK THE GENTLEMAN FROM NORTH CAROLINA, MR. VALENTINE, FOR HIS HARD WORK ON THIS BILL. THE TECHNOLOGY AND COMPETITIVENESS SUBCOMMITTEE HELD HEARINGS AND REPORTED THIS LEGISLATION LAST NOVEMBER. THE GENTLEMAN FROM NORTH CAROLINA HAS BEEN MOST HELPFUL IN WORKING TO REACH THE CONSENSUS ON H.R. 2936, AND I WANT TO ACKNOWLEDGE HIS CONTRIBUTIONS.

THE GENTLEMAN FROM VIRGINIA, MR. BOUCHER, HAS TAKEN A LEADING ROLE IN FORGING THE

COMPROMISE ON THIS LEGISLATION, AND I WOULD LIKE TO COMMEND HIS LEADERSHIP ON THIS ISSUE. I WOULD ALSO LIKE TO ACKNOWLEDGE THE HARD WORK AND COOPERATION ON THIS BILL BY THE GENTLEMAN FROM CALIFORNIA, MR. PACKARD, RANKING MEMBER OF THE SCIENCE SUBCOMMITTEE, THE GENTLEMAN FROM FLORIDA, MR. LEWIS, RANKING MEMBER OF THE TECHNOLOGY AND COMPETITIVENESS SUBCOMMITTEE, AND THE GENTLEMAN FROM PENNSYLVANIA, MR. WALKER.

TWO-YEAR COLLEGES HAVE BECOME A MAJOR FORCE IN AMERICAN HIGHER EDUCATION OVER THE PAST THIRTY YEARS. THERE ARE APPROXIMATELY 5 MILLION STUDENTS ENROLLED IN TWO-YEAR

COLLEGES, REPRESENTING 43 PERCENT OF ALL UNDERGRADUATE STUDENTS IN THE UNITED STATES. APPROXIMATELY 30 PERCENT OF THESE STUDENTS WILL TRANSFER TO FOUR-YEAR COLLEGES AND UNIVERSITIES.

TWO-YEAR COLLEGES ARE PARTICULARLY IMPORTANT AS A POTENTIAL SOURCE OF FUTURE SCIENTISTS AND ENGINEERS, AND AS A SOURCE OF RETRAINING FOR "NONTRADITIONAL STUDENTS" ALREADY IN THE WORKFORCE. THE LEGISLATION WE ARE CONSIDERING WILL STRENGTHEN AND IMPROVE SCIENCE AND MATHEMATICS EDUCATION AT TWO-YEAR COLLEGES, AND I URGE MY COLLEAGUES TO SUPPORT H.R. 2936.

Explanation of H.R. 2936

The bill before us today authorizes $35 million in each of fiscal years 1992 and 1993, from funds previously authorized to be appropriated, for the establishment of new NSF programs to benefit two-year colleges:

1. The "National Advanced Scientific and Technical Education Program" will provide grants relying upon traditional NSF methods such as the development of model instructional programs, the development of faculty and instructors in advanced technology fields, the development and dissemination of model instructional materials, the purchase or lease of state-of-the-art instrumentation, and the establishment of partnership arrangements between two-year colleges and the private sector;

2. The "National Centers of Scientific and Technical Education" program authorizes NSF to designate as many as ten centers which will serve as clearinghouses and models for the benefit of both two-year and secondary schools;

3. "Outreach grants" will assist two-year colleges in forming partnerships with four-year academic institutions to facilitate student transfers; and

4. "Partnership grants" will enable two-year colleges to work with secondary

schools in their region to improve the science and mathematics skills of students who will be attending two-year colleges.

For each program, grants will be awarded on a competitive, merit basis to associate-degree-granting colleges that will make contributions, in cash or in kind, toward the cost of the programs.

This legislation builds upon initiatives being undertaken by the NSF on a very small scale. Last year, NSF provided $3.35 Million in grants to associate-degree-granting colleges. We believe NSF's budget is adequate to allow for enlargement of the NSF role in improving science and mathematics education at two-year colleges, without interfering with the NSF's existing undergraduate programs.

The legislation also includes a provision to correct a problem identified at the Subcommittee's March 12 hearing on the management of the NSFNet. The testimony at the hearing supported dropping an NSF policy which imposes unneeded controls on traffic traveling on the NSFNet backbone. NSF stated that the policy is required by the NSF enabling statute. The legislation modifies the NSF Act of 1950 to remove this requirement.

The CHAIRMAN. The bill before us actually sets up a small program, administered by NSF, to provide additional assistance in strengthening their science and technology programs to community colleges throughout the United States.

If any member requests a fuller explanation or has any questions about this material, I will ask the staff to give a more elaborate explanation rather than reading my statement. However, I will ask Mr. Walker for any statements he might wish to make about the legislation.

Mr. WALKER. Thank you, Mr. Chairman. I am pleased to support this bill. Community colleges educate and train a sizeable portion of American students, and especially older and poorer students. These colleges should be full participants in the Federal efforts to improve undergraduate education.

As I say, I do support the bill. I ask unanimous consent that my entire text be put in the record.

[The prepared statement of Mr. Walker follows:]

Hon. Robert S. Walker

Full Committee Markup of H.R. 2936
Technical Education and Training Act of 1991

April 2, 1992

Mr. Chairman, I am pleased to be able to support this bill today. Community colleges educate and train a sizeable proportion of American students, especially older and poorer students. The colleges should be full participants in federal efforts to improve undergraduate education.

This bill should increase educational opportunities at community colleges without being fiscally irresponsible or distorting the mission of the National Science Foundation (NSF). I want it thank Mr. Price, Mr. Boucher, and Mr. Packard for negotiating a consensus version of this measure. The current bill focuses support on the most effective means of enhancement such as curricula and teacher development and various partnerships with the four-year colleges, high schools, and the private sector. The substitute to H.R. 2936 also limits programs to those within NSF's mission, provides funding out of existing authorizations, and requires matching funds from the institutions.

The Committee report eliminates my remaining concerns by specifying that these new programs will not be funded at the expense of NSF's existing undergraduate efforts, and will not extend NSF funding to any new uses such as tuition or faculty salary subsidies.

The bill strikes the proper balance between our commitment to upgrade the nation's workforce and to constrain the role of the federal government.

I feel obliged to mention that NSF is opposed to the bill based on the fact that they already have sufficient authority to achieve its goals. I had submitted an amendment in an effort to remove their opposition, but the Administration is not able to commit at this time. In light of that, and the fact that I feel the legislation does no budgetary harm and has policy benefit, I will not offer the amendment and urge the Committee to report the bill.

Thank you, Mr. Chairman.

Mr. **Walker**. I do feel obliged to mention that NSF is opposed to the bill based on the fact that they think they already have sufficient authority to achieve its goals.

I had submitted an amendment in an effort to remove their opposition, but the Administration is not able to commit to that amendment at this point as solving their problems. In light of that, and the fact I feel the legislation does no budgetary harm and has a policy benefit, I will not offer that amendment and will urge the committee to report the bill.

The **Chairman**. I want to thank the gentleman for his excellent statement. I appreciate it very much.

There are no other members of the appropriate subcommittees here, but Mrs. Lloyd—

Mrs. **Lloyd**. Mr. Chairman, I would like to support this bill, and ask unanimous consent that my statement appear in the record at this point.

The **Chairman**. Without objection, that will be ordered.

[The prepared statement of Mrs. Lloyd follows:]

OPENING STATEMENT HON. MARILYN LLOYD

H.R. 2936

APRIL 1, 1992

MR. CHAIRMAN, I WANT TO CONGRATULATE YOU AND CHAIRMAN BOUCHER OF THE SCIENCE SUBCOMMITTEE FOR BRINGING H.R. 2936, THE SCIENTIFIC AND TECHNICAL EDUCATION ACT OF 1992 BEFORE THE COMMITTEE. THE BILL ADDRESSES PROGRAMS IN SCIENCE AND TECHNICAL EDUCATION THAT I BELIEVE HAVE BEEN NEGLECTED IN RECENT YEARS. A PARTICULAR CONCERN OF MINE HAS BEEN THE NEED TO STRENGTHEN COMMUNITY COLLEGE PROGRAMS IN TECHNICAL EDUCATION AND TRAINING.

OUR COMMITTEE HAS FREQUENTLY HEARD CONCERNS FROM THE SCIENTIFIC COMMUNITY REGARDING THE DECLINE IN THE QUALITY OF SCIENCE AND MATHEMATICS AT ALL LEVELS IN OUR EDUCATION SYSTEM. THIS DECLINE HAS REACHED

SERIOUS PROPORTIONS, AND I BELIEVE STEPS MUST BE TAKEN NOW TO ENSURE THAT WE HAVE A WORK FORCE THAT IS QUALIFIED TO MEET THE TECHNOLOGICAL DEMANDS OF THE FUTURE.

INTERNATIONAL STUDIES AND REPORTS INDICATE THAT THE UNITED STATES IS FAR BEHIND MOST OTHER INDUSTRIALIZED NATIONS IN EDUCATING STUDENTS IN SCIENCE AND MATHEMATICS. THE TECHNICAL BASE PRODUCED BY OUR EDUCATIONAL INSTITUTIONS IS A CRITICAL COMPONENT OF OUR NATIONAL COMPETITIVENESS. IF WE ARE TO COMPETE INTERNATIONALLY AND PROVIDE OUR CITIZENS WITH THE WELL PAYING HIGH TECHNOLOGY JOBS, WE MUST PROVIDE THE COMMENSURATE QUALITY OF EDUCATION.

I BELIEVE THAT THE ASSISTANCE PROVIDED TO COMMUNITY COLLEGES IN THE LEGISLATION TO ENHANCE THEIR SCIENCE AND TECHNICAL PROGRAMS HAS BEEN SORELY LACKING. THE COMMUNITY COLLEGE PROVIDES A MUCH-NEEDED SUPPLEMENT TO OUR FOUR YEAR INSTITUTIONS. PROVIDING

ASSISTANCE THROUGH A GRANTS PROGRAM FROM THE NATIONAL SCIENCE FOUNDATION WILL ENABLE OUR LOCAL TWO YEAR INSTITUTIONS TO ENHANCE QUALITY EDUCATION PROGRAMS. THE PROGRAMS WILL HELP US TO PROVIDE THE HIGHLY SKILLED TECHNICIANS NEEDED TO MEET OUR FUTURE ECONOMIC ASPIRATIONS.

I FULLY SUPPORT THE LEGISLATION AND APPLAUD THE EFFORTS OF THE COMMITTEE TO MOVE THE BILL FORWARD.

The **Chairman**. Without objection, the bill is considered as read and open for amendments. I would ask unanimous consent that the bill as reported by the subcommittee be considered as the original text for the purpose of markup.

[No response.]

The **Chairman**. Hearing no objection, it is so ordered.

I might also indicate that the chairmen of the respective subcommittees, who unfortunately had other business this morning and could not be here, I am sure have statements which I would like to ask unanimous consent be inserted in the record at this point.

[The prepared statements of Mr. Boucher, Mr. Packard, and Mr. Valentine follow:]

OPENING STATEMENT
BY
THE HONORABLE RICK BOUCHER (D-VA)
ON THE MARK-UP OF H.R. 2936

APRIL 2, 1992

This morning the Committee on Science, Space, and Technology will consider H.R. 2936, the "Scientific and Technical Education Act of 1992."

Two-year colleges have become a major force in American higher education over the past thirty years. There are approximately 5 million students enrolled in two-year colleges, representing 43 percent of all undergraduate students in the United States. Approximately 30 percent of these students will transfer to four-year colleges and universities.

Two-year colleges are particularly important as a potential source of future scientists and engineers. These institutions face some unique problems in delivering quality education to their students. Some faculty are not well trained, have heavy teaching loads, and work in an environment where laboratory facilities and equipment are often outmoded and expensive to upgrade.

The National Science Foundation is already providing assistance on a very small scale to two-year colleges. Last year, the NSF provided $3.35 million in grants to associate-degree-granting colleges. We believe that the NSF budget is adequate to allow for a substantial enlargement of the NSF role in improving science and math education at two-year colleges, without interfering with the NSF's existing undergraduate programs.

The bill before us today authorizes $35 million in each of fiscal years 1992 and 1993, from funds previously authorized to be appropriated, for the establishment of new NSF programs to benefit two-year colleges:

1. The "National Advanced Scientific and Technical Education Program" will provide grants relying upon traditional NSF methods such as the development of model instructional programs, the development of faculty and instructors in advanced technology fields, the development and dissemination of model instructional

materials, the purchase or lease of state-of-the-art instrumentation, and the establishment of partnership arrangements between two-year colleges and the private sector;

2. The "National Centers of Scientific and Technical Education" Program authorizes NSF to designate as many as ten centers which will serve as clearinghouses and models for the benefit of both two-year colleges and secondary schools;

3. "Outreach Grants" will assist two-year colleges in forming partnerships with four-year academic institutions to facilitate student transfers; and

4. "Partnership Grants" will enable two-year colleges to work with secondary schools in their region to improve the science and math skills of students who will be attending two-year colleges.

For each program, grants will be awarded on a competitive, merit basis to associate-degree-granting colleges that will make contributions, in cash or in kind, toward the cost of the programs.

The consensus reflected in the bill before the Committee today builds upon initiatives already being undertaken by the NSF, and emphasizes traditional NSF methods of improving scientific and technical education. I believe the legislation reported by the Subcommittee on Science will strengthen and improve the science and math education at two-year colleges, and urge my colleagues to support it.

The legislation also includes a provision to correct a problem identified at the Subcommittee's March 12th hearing on the management of the NSFNet. The testimony at the hearing supported dropping an NSF policy which imposes unneeded controls on traffic traveling on the NSFNet backbone. NSF stated that the policy is required by the NSF enabling statute. The legislation modifies the NSF Act of 1950 to remove this requirement.

STATEMENT OF
THE HONORABLE RON PACKARD
FULL COMMITTEE MARKUP
HR 2936, SCIENTIFIC AND TECHNICAL EDUCATION ACT OF 1992
10:00 AM, 2318 RHOB
APRIL 2, 1992

This bill represents a consensus that was worked out with the Chairman of the Science Subcommittee, Mr. Boucher, and the Ranking Republican of the Full Committee, Mr. Walker, as well as Mr. Price, Mr. Hoagland and the Members of the Technology and Competitiveness Subcommittee.

The emphasis in the bill has been shifted from support for training programs at two-year colleges to improvement of scientific and technical education which is the expertise of the National Science Foundation.

Due to the changes that were made in the bill before the Science Subcommittee markup, I am happy to say that I am a cosponsor of this legislation.

Two-year colleges play an intricate role in the education of this nation's undergraduates especially since they represent the place where nearly one-half of all college students will take their introductory college math and science classes.

It is my hope that this legislation will help to facilitate the enhancements needed in scientific and technical education at two-year colleges.

MARK-UP STATEMENT

COMMITTEE ON SCIENCE, SPACE,
AND TECHNOLOGY
THE HONORABLE TIM VALENTINE (D-NC)
APRIL 2, 1992

H.R. 2936

Mr. Chairman, I strongly support the legislation before us today, H.R. 2936, the Scientific and Technical Education Act of 1992.

As you know, on October 31st, 1991, the Subcommittee on Technology and Competitiveness marked-up the original version of this bill, called the Technical Education and Training Act of 1991, introduced by my good friend and colleague, Mr. David Price.

I am pleased that the Science Subcommittee also reported this important legislation, and it is now before the full Committee.

We continue to hear testimony that we must provide an alternative to underemployment for individuals who choose not to pursue a four year college degree. Today, forty-two million people are employed in jobs that require a significant amount of training beyond a basic education, but not a four year degree. Unfortunately, the American system of education works poorly for many of these people. Today's system does not permit efficient articulation between education levels and does not adequately blend work-based or technical subject matter with the more traditional core programs of study in the basic sciences.

This legislation is a start towards improving the scientific and technical education for the large number of Americans who want to acquire the skills that will lead to good-paying careers, but who are not pursuing a baccalaureate degree.

Our educational infrastructure must be improved in a way that produces quality graduates who are able to contribute to the high technology work place. I urge my colleagues to support this legislation. The realities of the international economy and global competition require it.

The CHAIRMAN. I'd be glad to recognize Mr. Thornton.

Mr. THORNTON. Thank you, Mr. Chairman.

As a member of the subcommittee, I would like to report that these matters came forward after complete, comprehensive hearings and represented a strong bipartisan approach within the subcommittee, led by Mr. Boucher. I hope that this will be adopted expeditiously in full committee so that it can move forward.

The CHAIRMAN. Thank you very much, Mr. Thornton.

Are there any additional amendments to the bill?

[No response.]

The CHAIRMAN. If not, it is in order for a motion to report the bill, and the Chair recognizes Mr. Walker.

Mr. WALKER. Mr. Chairman, I move that the committee report the bill, H.R. 2936, as amended, or as not amended, and to instruct the staff to prepare the legislative report, to make technical and conforming amendments, and that the Chairman take all necessary steps to bring the bill before the House for consideration.

The CHAIRMAN. You have heard the motion. Is there any discussion?

[No response.]

The CHAIRMAN. If not, the Chair will put the question. All those in favor, signify by saying aye.

[Chorus of ayes.]

The CHAIRMAN. Opposed, no.

[No response.]

The CHAIRMAN. The motion is agreed to and the bill is reported.

APPENDIX

TEEX
Electronics Training Division 409 845 6762
Texas Engineering Extension Service The Texas A&M University System College Station Texas 77843 8000

REPLY OF

SAM VILLAREAL

TEXAS ENGINEERING EXTENSION SERVICE

TEXAS A&M UNIVERSITY SYSTEM

ON

SCIENCE AND TECHNOLOGY EDUCATION
IN TWO YEAR COLLEGES

BEFORE THE

SUBCOMMITTEE ON SCIENCE

US HOUSE OF REPRESENTATIVES

WASHINGTON, DC

NOVEMBER 19, 1991

REPLY OF
SAM VILLAREAL
TEXAS ENGINEERING EXTENSION SERVICE
TEXAS A&M UNIVERSITY SYSTEM
NOVEMBER 27, 1991

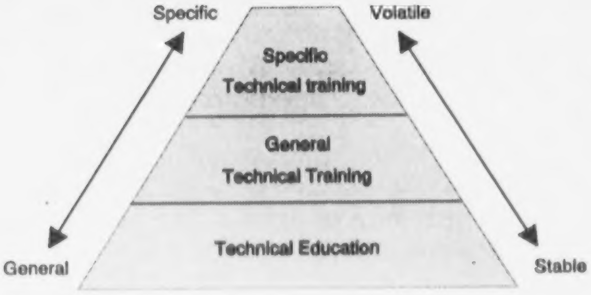
My name is Sam Villareal. I have been involved with TEEX (Texas Engineering Extension Service), a technical training agency, for the past several years. TEEX is a part of the Texas A&M University System. In particular, I have been involved in a strong partnership between TEEX and several of the major semiconductor manufacturers of Texas. My activities at TEEX correspond to the second stratum of the TEP described below. I met briefly with Jeff Ellison on Monday, November 18, to discuss training issues surrounding this legislation and was also present at the hearings on November 19. These conversations compel me to offer a reply. I believe the comments I offer represent a consensus of the Texas/TEEX partnership.

The proposed bill would enact legislation to strengthen the educational base in advanced technologies at community colleges. By promoting partnerships between community colleges and industry, the bill would provide for the development of a model curriculum tailored to meet the training needs of the nation's major industries.

My primary concern with this legislation is the actual impact it seems likely to promote. First of all it would weaken the quality of the overall technical educational system. Second, the accredited curricula of community colleges are not the best vehicle for the specific training needs of industry. And third, if the accredited curricula are the bill's main focus, then the measure would have no real impact on the work force until well into the 21st century.

First of all, consider the effect of H.R. 2936 and H.R. 3606 on what is known as the technical training and education pyramid (TEP). The TEP is shown in the diagram below.

This pyramid is comprised of three major strata, technical education, general technical training, and specific technical training. Technical education serves as a broad knowledge base upon which more specific training programs are built. The educational base of the platform is relatively



stable and generalized, while the apex is more volatile and specific. More stable institutions such as community colleges normally provide the general educational base of the pyramid. Industry itself must provide the more job-specific, technical training required at the apex.

The problem facing the nation at present is that a wide gap has opened up between the point where technical education ends and industry training begins. The type of training called for is that of the second stratum, general technical training. The measure attempts to narrow this gap by promoting cooperation between community colleges and industry and by tailoring the accredited curricula of community colleges to meet industry needs. The bill assumes that general technical training, that of the second stratum, can be provided by community colleges. This plan is flawed on several accounts.

The technical education base of the pyramid, as previously stated, is relatively stable in comparison to the apex. While the specific training needs of industry change on a yearly basis, more generalized technical education needs might change every ten years. By tailoring the curricula of community colleges to the specific training needs of industry, the measure would introduce volatility into the institutions which should provide the general knowledge base. This would weaken the foundation of the overall structure because technicians would not receive the general education they need as a base upon which to build. This knowledge base must remain relatively stable before we can ever hope build on it. Otherwise we shall create technicians who can repair one brand of equipment but not another. They will not receive the necessary educational background.

If we begin changing what should be a more stable curriculum to meet current industry needs, then we substantially weaken the educational base which serves as a foundation. Resources must be put into organizations designed to provide training within the second stratum of the pyramid and not those organizations which establish the base. As written, the legislation does not distinguish between accredited curricula and non-accredited, continuing-education curricula. This compounds the confusion between education and training, between the stable base of the TEP and the more volatile and responsive second stratum. The emphasis of the legislation must be re-written to clarify these distinctions and ensure that both needs are adequately met.

Furthermore, because the community colleges comprise a stable base, they will not be able to keep pace with the demands of changing technology. On the average, the modern technological environment undergoes a complete transformation every five years or so. Because of this fact junior colleges could never hope to modify their accredited curricula fast enough to meet the developing needs of industry. At present it takes two to three years for an institution to receive accreditation for a new curriculum. By this time industry needs will have changed, and the new curriculum will be obsolete. Industry needs a sensitive and responsive partner which can provide the training solutions needed for a rapidly changing technological environment. Junior colleges have an important function in that they provide a stable educational base, but they will never be able to provide the training solutions necessary for the rapid technological advances of the 21st century. Even if they could provide this service, that would only result in a substantial weakening of the educational pyramid.

For other reasons as well, community colleges would not be able to serve as the best possible vehicle for the type of training needed. Since 85% of the work force in the year 2000 is already on the job, only 15% of the work force in the year 2000 may be affected by the proposed legislation. At the present rate it would take approximately twenty years before the proposed legislation would have a substantial effect on the work force profile. In twenty years America will have lost the race. The measure must address the needs of the 85% already on the job. A measure which focuses on the remaining 15% would result in a tragic waste of resources.

These views are strongly supported by representatives of the Texas semiconductor industry. Among those interviewed, I found 100% compliance with the viewpoint I have established. These include representatives from Texas Instruments, Motorola, Applied Materials, and Sematech. I would welcome the opportunity to further discuss these issues at your convenience.

Sincerely,

Samuel S. Villareal

December 11, 1991

Honorable Rick Boucher
Chairman, House Science Subcommittee
2319 Rayburn Building
Washington, D.C. 20515

Dear Mr. Chairman:

On behalf of the Engineering Education Coalition, a multi-society group dedicated to the support of engineering education and research, I write to express our views on HR 2936, the Technical Education and Training Act of 1991, introduced by Rep. David Price. We ask that this letter be made part of the Subcommittee's hearing record on this legislation.

The Engineering Education Coalition consists of the American Society for Engineering Education (ASEE) and its Engineering Deans Council, the National Association of State Universities and Land Grant Colleges (NASULGC) and the National Society of Professional Engineers (NSPE).

U.S. economic competitiveness depends on a highly skilled technical workforce--from technicians and technologists to professional and research engineers. While the nation has created an outstanding system for educating those aiming for advanced degrees, it has focused less attention on technicians and technologists. Yet these occupations are a vital link in both upgrading the nation's manufacturing capabilities and in providing meaningful technical employment for a broad group of talented individuals.

For that reason, the Engineering Education Coalition welcomes congressional efforts to initiate and coordinate federal support for advanced technician programs. We also believe that the National Science Foundation, in conjunction with other federal agencies, can provide valuable leadership in this area. NSF can be a catalyst for improving curricula and instruction and for stimulating academic interest in these advanced technical occupations.

In our view, HR 2936, as approved by the Technology Subcommittee, delineates an appropriate role for the Foundation in this area. This includes curriculum improvement, faculty development, personnel exchange with industry and government agencies, purchase of instrumentation and dissemination of instructional materials. All of these are activities which the Foundation currently funds. In addition, there is value in funding outreach activities to the high schools and promoting articulation with four-year schools.

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We are concerned, however, that these new focused programs would be funded at the expense of existing NSF undergraduate education programs. As you know, the authorization total for the advanced technician programs would be $50 million, or just about equal to the current funding for the entire NSF Undergraduate Education Division. If advanced technician training is added to the NSF mission, it should be supported with supplemental funds and not simply added on as an unfunded task.

The existing undegraduate education programs are addressing an important need and are already underfunded. We believe it would be a grave mistake to disrupt these programs in order to fund new ones.

Accordingly, we hope that if HR 2936 becomes law, its advocates will commit themselves to supporting increased appropriations for the Foundation, including for the existing undergraduate education programs, as well as for the advanced technician programs.

Thank you for your consideration of our views. Please contact me if there are any questions.

Sincerely,

V. David VandeLinde

V. David VandeLinde
Coalition Chair
Dean of Engineering
Johns Hopkins University

cc: Frank Huband, ASEE
Ann Leigh Speicher, ASEE
Martin Jischke, University of Missouri-Rolla
Gerald Roschwalb, NASULGC
David Waugh, University of South Carolina
Donald Weinert, NSPE
Robert Reeg, NSPE

ASEE is a membership society of 10,000 engineering faculty members, as well as colleges of engineering and technology and engineering-oriented companies.

NSPE is a professional society representing 75,000 professional engineers in industry, education, private practice, construction and government.

NASULGC is a higher education association whose member public colleges and universities graduate 70 percent of the nation's engineers and perform 70 percent of the nation's university-based engineering research.

SUBCOMMITTEE REPORT
TECHNICAL EDUCATION AND TRAINING ACT OF 1991

[To accompany H.R. 2936]

The Subcommittee on Technology and Competitiveness of the Committee on Science, Space, and Technology, to whom was referred the bill (H.R. 2936) to authorize appropriations to the National Science Foundation to carry out an advanced technical education and training program under which accredited associate-degree-granting colleges, using matching non-Federal funds, are authorized to provide educational training in technical competencies in strategic fields, and for other purposes, having considered the same, report favorably thereon and recommend that the bill do pass.

HISTORY OF SUBCOMMITTEE ACTIVITIES

H.R. 2936 was introduced by Representative David Price on July 17, 1991. The bill was referred jointly to the Committtee on Science, Space, and Technology and the Committee on Education and Labor. Within the Committee on Science, Space, and Technology, referral was made to the Subcommittee on Technology and Competitiveness and the Subcommittee on Science.

On September 17th, the Subcommittee held a legislative hearing on H.R. 2936, the "Technical Education and Training Act of 1991," (Mr. Price, D-NC) and H.R. 3507 (not numbered at the time of the hearing) the "American Industrial Quality and Training Act of 1991," (Mr. Valentine, D-NC). Mr. Price's bill focuses on strengthening community college programs of technical education and training through the authorization of a new program at the National Science Foundation. Mr. Valentine's bill addresses U.S. industrial competitiveness through the creation of training programs tied directly to private sector firms. Both bills strive to strengthen the nation's training infrastructure and ensure that the proper information is collected for further policy development, review, and oversight.

As stated in the hearing charter, the purposes of this hearing were the following:

1. To examine the role that the federal government should play in issues of workforce training and technical

education and how these issues affect U.S. industrial competitiveness.

2. To gather expert opinion on H.R. 2936, "The Technical Education and Training Act of 1991" and H.R. 3507, "The American Industrial Quality and Training Act of 1991" in order to aid in Subcommittee legislative deliberations.

The testimony summarized below addresses H.R. 2936.

Witnesses made the point that the federal government should play an enabling or catalytic function in supporting worker training and technical education. Thus, it should focus on infrastructure building or those efforts that will enable further program development to flourish at the state and local levels or within the private sector. The Subcommittee heard near universal support for H.R. 2936.

The Subcommittee heard from Representative David Price who testified on behalf of his own bill. Mr. Price stated that his legislation would substantially upgrade the ability of community and technical colleges to train students in technical disciplines. He recommended an authorization level of $45-50 million for the coming fiscal year. The bill also places emphasis on encouraging non-traditional student enrollments.

Dr. Luther S. Williams, Assistant Director for Education and Human Resources, represented the National Science Foundation and testified that the bill is conceptually very sound. He opposed the actual bill, however, stating that the NSF already has the authorization to pursue such programs and therefore the bill was unnecessary. Since testifying and in response to Mr. Valentine's request, the National Science Foundation has submitted documentation of their claim.

Ms. Martha Quesada, Team Member, New United Motor Manufacturing (NUMMI), discussed the legislation from the perspective of a front-line auto worker who is employed by a company that places substantial emphasis on training. She particularly liked the fact that H.R. 2936 emphasizes non-traditional students.

Dr. Anthony Carnevale, Vice President and Chief Economist for the American Society for Training and Development, emphasized the need for the federal government to place emphasis on enabling a wide range of businesses to compete rather than focusing on narrow efforts.

Mr. James Schwarz, President of Omni-Circuits, Inc., spoke about his relationship as a supplier to Motorola. He also spoke about his difficulty in finding skilled workers. He praised H.R. 2936 but stated that H.R. 3507 more closely fit his needs.

Dr. David Pierce, President of the American Association for Community and Junior Colleges, testified that federal authority for technical education has become fragmented. There are too many federal agencies are involved.

In addition to the witnesses listed above, written testimony for the official record was requested from Robert W. Scott, President of the North Carolina System of Community Colleges, Secretary of Education Lamar Alexander, Under Secretary of Commerce for Technology Robert M. White, and Secretary of Labor Lynn Martin.

Robert Scott testified that passage of H.R. 2936 is important to community colleges as well as the nation's industrial complex. He testified strongly in support of the Outreach and Partnership Grants section of the legislation.

Secretary Alexander testified that he supported most of the goals of the bill. However, he felt that the proposals duplicated many of the activities authorized under the Adult Education Act, the Carl D. Perkins Vocational and Applied Technology Education Act, and the Job Training Partnership Act. He did include in his testimony that the concepts underlying the proposals were sound.

Under Secretary White deferred to Luther Williams on H.R. 2936 and focused his testimony on H.R. 3507. Assistant Secretary Jones also stated that the Department of Labor supported the goals of H.R. 2936, but the Department felt that the legislation was duplicative.

On the basis of suggestions made by witnesses at the hearing, by testimony submitted for the record, and by discussions with other interested groups, the Subcommittee on Technology and Competitiveness developed a substitute amendment to H.R. 2936. The amendment in the nature of a substitute gave more discretion to the National Science Foundation in developing the programs authorized by H.R. 2936. The Subcommittee on Technology and Competitiveness ordered reported the substitute offered by Chairman Valentine on October 31, 1991.

SECTION-BY-SECTION EXPLANATION OF THE BILL

SECTION 1, Short Title

This Act may be cited as the "Technical Education and Training Act of 1991."

SECTION 2, Findings

The findings explain that the United States is at a disadvantage in the global economy because the American workforce is not adequately trained for the technologically advanced modern workplace. The improvement of our workforce's productivity and our international economic position depend upon the substantial upgrading and coordination of our educational efforts in science, mathematics, and technology, especially at the associate degree level. The National Science Foundation's traditional role in developing model curricula, disseminating instructional materials, enhancing faculty development, and stimulating partnerships between educational institutions and industry, makes an enlarged role for the Foundation in technical education and training particularly appropriate.

SECTION 3, Technical Education and Training

This secton establishes three program within the National Science Foundation to address the problems described in the findings.

The National Advanced Technical Education and Training Program authorizes NSF to award matching grants to associate-degree-granting colleges to provide educational training in technical competencies in strategic fields. These grants shall be used to develop collaborative programs with local employers and technical occupational training and shall place emphasis on attracting men and women to the program who are nontraditional students or who left high school prior to graduation. The program calls for funding of instructional programs, faculty development programs, personnel exchanges, cooperatives with industry, purchase of instrumentation, and dissemination of the instructional materials.

Under the National Centers of Technical Education and Training program, the Director of NSF is to establish 10 centers of excellence among associate-degree-granting colleges with exceptional programs of advanced technical education and training and that excel in undergraduate education in mathematics and science.

Under the Articulation Partnerships program, the Director of NSF is to make grants to establish partnerships to assist associate-degree-granting colleges and 4-year academic institutions in helping students to make the transition from associate-degree-granting colleges to 4-year academic institutions. The students would be able to achieve bachelor degrees in mathematics, science, engineering, or technology.

SECTION 4, Authorization of Appropriations

H.R. 2936 authorizes to be appropriated to the National Science Foundation $50,000,000, from sums otherwise authorized to be appropriated, for each of the fiscal years 1992 through 1996 to carry out this legislation.

BACKGROUND

There is now broad consensus that workforce skill and education levels are important elements in the international competitiveness of U.S. business. In the past, much of the expansion in our economy had to do with the increasing size of our labor pool. Because of a slowing population growth rate, the nation will have to depend more heavily upon increases in national productivity growth rates in order to fuel economic expansion. Achieving vastly higher rates of growth in productivity will require a change in American business organization practices and a much stronger emphasis on workforce training and on quality education at all levels and of all types.

In a "high-performance workplace", workers make decisions and exercise their own judgment and expertise when faced with a problem. Gone is the need to follow strict procedures by the manual or to wait for supervisors to arrive on the shop floor. For this reason, organizational structures become flatter, management layers are not needed and vanish. Production workers begin to take over many of the tasks which used to be performed by management. Workers need to have advanced skills and more advanced technical training in order to perform more complex jobs.

Fifty percent of our seniors terminate their formal education with graduation from high school. Moreover, more than 20 percent of all students drop out before completing high school (the figure is as high as 50 percent in many inner cities). This is due, in part, to a fault in our system. Many high school students see no clear link between school and jobs; or at least they see no well defined route between the two.

Today, half of our high school students are confined to the so-called general track, offering them neither strong academic nor work-based skills. At best, these young people face low-skill, low-paying secondary labor market jobs for at least a period of a year or more following graduation; at worst, they face unemployment.

A survey of adults ages 21 to 25, titled the National Assessment of Education Progress (NAEP) states, "By yesterday's standards the news is good: Ninety-five percent can read and understand the printed word. In terms of tomorrow's needs, there is cause for concern: Only a very small percentage can understand complex material. While we don't have a major illiteracy problem, we do need to improve the skills of most of our young adults. In other words, we do have a literacy problem."

Japanese high school students must complete at least two years of mathematics and two years of science. Many U.S. schools require only one year of mathematics and science. Ninety percent of all Japanese graduate from high school. They attend school 240 days a year and spend an average of two hours per day studying compared with about one hour for American students. Moreover, despite the fact that Japan has half the population of the U.S., it graduates more engineers from undergraduate college programs than does the U.S.

Industry must realize that the education system is perhaps its most important supplier. For this reason, it must work with schools--as it does with other suppliers--to ensure that the product it receives meets its needs. Toward this end, then Secretary of Labor Elizabeth Dole, in 1990, appointed the Secretary's Commission on Achieving Necessary Skills (SCANS). SCANS will be attempting to improve the relevance of education to achieving national economic and competitiveness goals. The first step is to identify the specific skills that workers need for productive employment. The Commission will recommend proficiency levels, the means to achieve those levels, and effective ways to determine whether or not students are attaining those levels. The Commission on the Skills of the American Workforce suggests taking one step further by awarding technical and professional certificates for various mastery levels.

The U.S. must begin to think in terms of an alternative formal system to university education which is capable of providing alternative routes to productive careers for noncollege-bound students. Unfortunately, at this time the U.S. "system" works very poorly. It does not permit efficient articulation between education levels and does not adequately blend work-based or technical subject matter with the more traditional core programs of study in the basic sciences.

Studies have shown that workers with postsecondary technical education perform better when first hired and often eventually become candidates for higher level positions in the firm. Moreover, taking technical courses as a high school student is associated with only small cutbacks in the number of academic courses taken. It is also associated with substantially higher wage rates, employment and earnings in the eighteen months following graduation.

The need for some form of technical education is apparent. Forty-two million people are employed in jobs that require a significant amount of training beyond a basic education, but not a four-year college degree. It is in these jobs that occupation-specific skills shortages are most often found.

EXISTING PROGRAMS

The federal role in technical education is defined by two main programs. The Job Training Partnership Act (JTPA) programs are housed at the Department of Labor and are primarily worker training programs. These programs will not be discussed in this report. The Carl D. Perkins Vocational Education Act authorizes vocational and technical education programs at the Department of Education .

The Carl D. Perkins Vocational Education Act is budgeted at approximately $1 billion in FY 1991. No increase was requested in FY 1992. Of that, $63.4 million was requested for the Tech-Prep program with no increase planned in FY 1992. The Tech-Prep program is the only genuine technical rather than vocational education program funded by the federal government.

Many experts believe that Tech-Prep can help motivate high schools students through a very "hands-on" and applied curriculum. Students can see why they are learning the information that they are learning and what effect it may have on their future careers. It is believed that colleges will gain better prepared high school students and employers will gain employees with advanced skills. The Tech-Prep program is a 2+2 program. It operates by introducing the high school student in his or her junior year to an integrated and gradually more complex technical preparation program that terminates with a community or technical college degree. It is based on the idea that students function best when goals are clear and expectations realistically based and they know why they are in school.

SCIENTIFIC AND TECHNICAL EDUCATION ACT OF 1992

MR. BOUCHER, from the Subcommittee on Science, Committee on Science, Space, and Technology submitted the following

REPORT

[To accompany H.R. 2936]

The Subcommittee on Science of the Committee on Science, Space, and Technology, to which was referred the bill (H.R. 2936) to establish programs at the National Science Foundation to strengthen and improve the scientific and technical education capabilities of associate-degree-granting colleges, and for other purposes, met on March 18, 1992 and having considered the same, ordered the bill reported with an amendment in the nature of a substitute by unanimous voice vote.

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I. Background and Need for Legislation
II. Summary of Subcommittee Actions; Explanation of Amendment
III. Committee Views
IV. Section by Section Analysis
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I. BACKGROUND AND NEED FOR LEGISLATION

Two-year colleges are a major contributor to higher education in the United States today. In 1990, 1350 two-year colleges enrolled approximately 5 million students, representing 43 percent of all undergraduate students and constituting 40% of all institutions of higher education. Approximately 30% of students enrolled in two-year colleges transfer to four-year colleges and universities.

From the standpoint of science and technology education, two-year colleges are particularly important as a potential source of future scientists and engineers. The significance of associate-degree-granting colleges has long been recognized by American business and industry, which spends about $1.3 billion annually on training provided by two-year colleges.

While two-year colleges play an important role in science and technology education, these institutions face unique problems in delivering quality education in scientific and advanced technology fields to their students. Faculty members face heavy teaching loads and are frequently unable to keep up to date with the latest developments in their field. Laboratory facilities and equipment are frequently outmoded and expensive to upgrade.

The National Science Foundation (NSF) has played a major role as a catalyst in upgrading undergraduate science and mathematics programs at four-year-colleges. Although the NSF has supported programs in scientific and advanced technology education at two-year colleges, the level of effort has been small relative to other undergraduate programs and to the contribution of two-year colleges to undergraduate education. While the fiscal year 1993 budget request for the NSF is $3.03 billion, NSF is currently spending only about $3.35 million on grants to two-year colleges, with more than one-half of the funding allocated to instrumentation and to laboratory improvements. The NSF has itself recognized the need for a stronger role in this area. A January, 1989 report by the NSF entitled "Science and Engineering Education in Two-Year Colleges" concluded, "Programs in science, mathematics, and engineering must be developed that are more attractive and engaging for two-year college students." The Subcommittee believes that the current budget of the NSF is adequate to enable an expansion of NSF's role in assisting associate-degree-granting colleges, without interfering with funding for the NSF's existing undergraduate programs.

Two major legislative initiatives have been proposed in the 102nd Congress to enhance science and technology education programs at two-year colleges. Representative David Price (D-NC) introduced H.R. 2936, the Technical Training and Education Act of 1991 and Representative Peter Hoagland (D-NE) introduced H.R. 3606, the National Community College Technology Education Act. While the two bills differ somewhat in their approaches to the problem, the essence of both proposals is to rely on traditional NSF methods to upgrade science and mathematics education at two-year colleges. These traditional methods include competitive grants to accomplish the following objectives:

(a) develop of model curricula and instructional programs;

(b) provide faculty enrichment;

(c) develop and disseminate model instructional materials;

(d) purchase or lease of state-of-the-art instrumentation; and

(e) stimulate partnerships between educational institutions and the private sector.

The Subcommittee believes that the establishment of a grants program for two-year colleges emphasizing these traditional NSF methods will strengthen and improve science and mathematics education at associate-degree granting colleges. The new programs will in turn improve the skills both of students graduating from two-year colleges to work in advanced technology fields, as well as students who will transfer from two-year colleges to pursue bachelor degrees in science and mathematics at four-year colleges.

II. SUBCOMMITTEE ACTIONS; EXPLANATION OF AMENDMENT

H.R. 2936 was introduced by Representative David Price on July 17, 1991. The bill was referred jointly to the Committees on Science, Space, and Technology and Education and Labor. Within the Subcommittee on Science, Space, and Technology, referral was made to the Subcommittee on Science and to the Subcommittee on Technology and Competitiveness.

On September 17, 1991 the Subcommittee on Technology and Competitiveness held a legislative hearing on H.R. 2936 and H.R. 3507, the American Industrial Quality and Training Act of 1991 introduced by Representative Tim Valentine (D-NC). Witnesses included Mr. Price; Dr. Luther Williams, Assistant Director for Education and Human Resources, National Science Foundation; Ms. Martha Quesada, Team Member, General Maintenance, New United Motor Manufacturing, Fremont, California; Mr. Anthony Patrick Carnevale, Vice President and Chief Economist, American Society for Training and Development, Alexandria, Virginia; Mr. James E. Schwarz, Sr., President, OMNI-Circuits, Inc., Glenview, Illinois; and Dr. David R. Pierce, President, American Association of Community and Junior Colleges, Washington, D.C. The Subcommittee on Technology and Competitiveness developed an amendment in the nature of a substitute to H.R. 2936, which was ordered reported on October 31, 1991 by voice vote.

On November 19, 1991, the Subcommittee on Science held a legislative hearing on H.R. 2936 and H.R. 3606. Witnesses included Mr. Price; Mr. Hoagland; Dr. Luther Williams, Assistant Director for Education and Human Resources, National Science Foundation; Dr. William F. Snyder, President, Wytheville Community College, Wytheville, Virginia; Dr. Cary Israel, Director of Illinois Community College Board, Springfield, Illinois; Mr. P. Douglas Groseclose, Director of Staffing, Organization and Employee Development, Martin Marietta Electronics, Information and Missiles Group, Orlando, Florida; Mr. Jeff Ellison, Existing Base Manager, INTEL, Chandler, Arizona; and Dr. Paul C. Gianini, Jr., President, Valencia Community College, Orlando, Florida, and Chairman, Joint Commission on Federal Relations of the American Association of Community and Junior Colleges and of the Association of Community College Trustees.

Based on recommendations of the witnesses, an amendment in the nature of a substitute was developed by Chairman Boucher. The Subcommittee met on March 18, 1992, adopted the amendment and ordered the bill reported by voice vote.

The amendment retained the basic structure of H.R. 2936, while refining the proposal as follows:

1. provide greater discretion to the National Science Foundation in carrying out the programs authorized by H.R. 2936;

2. refocus the legislation to emphasize traditional National Science Foundation methods to upgrade scientific and advanced technology education programs at associate-degree-granting colleges;

3. eliminate the requirement in H.R. 2936 for matching non-federal funds to be provided by associate-degree-granting colleges as a condition of receiving a grant. The amendment requires that grantees must make contributions, in cash or in kind, toward the cost of programs funded by the bill; and

4. redirect the bill's authorization level by providing that there are authorized to be appropriated, from sums otherwise authorized to be appropriated, $35 million for fiscal year 1992 and $35 million for fiscal year 1993. The Subcommittee intent that the authorization level contained in the amendment will not interfere with the National Science Foundation's existing undergraduate programs in mathematics and science.

The consensus reflected in the amendment builds upon initiatives undertaken on a small scale by the NSF. The NSF is provided with greater discretion in administering the various grants programs, which are focused on

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reliance upon traditional NSF methods of improving scientific and technical education rather than assistance through support of training programs at two-year colleges.

The amendment also includes a provision to correct a problem identified at the Subcommittee's March 12, 1992 hearing on the management of the NSFNet. The problem involves the NSFNet acceptable use policy which imposes controls on the nature of traffic traveling on the NSFNet backbone. The testimony at the hearing supported dropping the acceptable use policy since it unnecessarily restricts traffic volume and has reduced the availability of commercial services to NSFNet users.

NSF stated at the hearing that they must impose the acceptable use policy in order to conform to the provisions of the NSF enabling statute. The amendment would modify the National Science Foundation Act of 1950 to allow NSF to remove the acceptable use policy, if the removal would result in an increase of the overall capability of the network to support research and education activities.

III. COMMITTEE VIEWS

1. Undergraduate Education

The Subcommittee views the programs authorized in this bill as necessary components of a balanced approach to undergraduate education. The Subcommittee expects that funding for the programs in this bill would not be at the expense of other undergraduate efforts.

2. Use of Funds

The Subcommittee intends that NSF administer the programs authorized in this bill in the same manner and under the same rules as all its other education programs. For example, indirect cost reimbursement and faculty salary support should be handled in the same manner as in existing NSF education programs. Funding should not be used to support remedial education or to subsidize student tuition.

IV. SECTION BY SECTION ANALYSIS

Section 1. Cites the short title as the "Scientific and Technical Education Act of 1992"

Section 2. Cites the following findings and reasons for introducing the legislation:

(1) the position of the United States in the world economy faces great challenges from highly trained foreign competition;

(2) The workforce of the United States must better prepare for the technologically advanced, competitive, global economy;

(3) the improvement of our workforce's productivity and our international economic position depend upon the strengthening our educational efforts in science, mathematics, and technology, especially at the associate-degree level;

(4) shortages of scientifically and technically trained workers in a wide variety of fields will best be addressed by collaboration among the Nation's associate-degree granting colleges and private industry to produce skilled, advanced technicians, and

(5) the Foundation's traditional role in developing model curricula, disseminating instructional materials, enhancing faculty development, and stimulating partnerships between educational institutions and industry, makes an enlarged role for the Foundation in scientific and technical education and training particularly appropriate.

Section 3(a). Establishes the "National Advanced Scientific and Technical Education Program". The Director of the National Science Foundation shall carry out a program to assist accredited associate-degree-granting colleges, and consortia thereof, to provide education in advanced-technology fields through such methods as:

A. the development of model instructional programs in advanced-technology fields;

B. the development of faculty and instructors, both full- and part-time, in advanced-technology fields;

C. the establishment of innovative partnership arrangements among associate-degree-granting colleges, the private sector, and state and local government (and, where appropriate, federal laboratories) including programs providing private sector donations, faculty opportunities to have short-term assignments with industry, sharing of program costs, equipment loans, and the cooperative use of laboratories, plants, and other facilities, and provision for relevant state-of-the-art work experience opportunities for students enrolled in such programs;

D. the purchase or lease of state-of-the-art instrumentation essential to programs designed to prepare and upgrade students in scientific and advanced-technology fields; and

E. the development and dissemination of instructional materials in support of improving the advanced scientific and technical education and training capabilities of associate-degree-granting colleges, including programs for nonscience students.

In carrying out this subsection, the Director shall award grants on a competitive, merit basis to colleges that will make contributions, in cash or in kind, toward the cost of programs funded by such grants, and establish and maintain a readily accessible inventory of programs which are funded under this subsection.

Section 3(b). Authorizes the Director to establish centers of excellence, not to exceed 10 in number, among associate-degree-granting colleges.

The centers shall serve as national and regional clearinghouses and models for the benefit of both colleges and secondary schools, and shall provide seminars and programs to disseminate model curricula and model teaching methods and instructional materials to other associate-degree-granting colleges in the geographic region served by the center. Centers designated under this subsection shall be geographically distributed and chosen by a competitive, merit-based application process from among colleges that will make contributions, in cash or in kind, toward the cost of programs funded by grants made under this subsection.

Section 3(c)(1). Authorizes the Director to make "partnership grants" to eligible partnerships to assist students pursuing bachelors degrees in mathematics, science, engineering, or technology to make the transition from associate-degree-granting colleges to bachelor-degree-granting institutions, through such means as:

(i) examining curricula to ensure that academic credit earned at the associate-degree-granting college can be transferred to bachelor-degree-granting institutions;

(ii) informing teachers from the associate-degree-granting college on the specific requirements of courses at the bachelor-degree-granting institution; and

(iii)providing summer programs for students from the associate-degree-granting college to encourage such students' subsequent matriculation at bachelor-degree-granting institutions.

Section 3(c)(2). Authorizes the Director to make "outreach grants to associate-degree-granting colleges to strengthen relationships with secondary schools in the community served by the college by improving mathematics and science education and encouraging the interest and aptitude of secondary school students for careers in science and advanced-technology fields. These grants shall be made through a competitive application process from among colleges that will make contributions, in cash or in kind, toward the cost of programs funded by grants made under this paragraph.

Section 3(d). Enumerates that in carrying out this section, the Director shall consult, cooperate, and coordinate, to enhance program effectiveness and to avoid duplication, with the programs and policies of other relevant federal agencies.

Section 3(e). Enumerates that to quality for a grant under this section, an associate-degree-granting college, or consortium thereof, shall provide assurances adequate to the Director that it will not decrease its level of spending of funds from non-federal sources on advanced scientific and technical education and training programs.

Section 3(f). "Definitions".

(1) the term "bachelor-degree-granting institutions" means accredited colleges, universities, and institutes of technology that award bachelor degrees in mathematics, science, or engineering, or a 4-year technology degree;

(2) The term "advanced-technology" includes advanced technical activities such as the modernization, miniaturization, integration, and computerization of electronic, hydraulic, pneumatic, laser, nuclear, chemical telecommunication, fiber optics, robotic, and other technological applications to enhance productivity improvements in manufacturing, communication, transportation, commercial, and similar economic and national security activities;

(3) the term "associate-degree-granting college" means a regionally-accredited postsecondary educational institution that has authority to award an associate degree or comparable technical certificate and has the mission of offering comprehensive education services to meet the needs of a prescribed community, including a 2-year junior college, community college, technical institute, or other postsecondary institution offering comprehensive associate-degree programs in technical field;

(4) the term "eligible partnership" means one or more associate-degree-granting colleges in partnership with one or more bachelor-degree-granting institutions; and

(5) the term "nontraditional students" means students who have been in the workforce and who desire to further their education and training in advanced-technology fields.

Section 4. An administrative amendment adding the following new subsection at the end of Section 3 of the National Science Foundation Act of 1950:

"(g) in carrying out subsection (a)(4), the Foundation is authorized to foster and support the development and use of computer networks which may be used substantially for purposes in addition to research and education in the sciences and engineering, if the additional uses will tend to increase the overall capabilities of the networks to support such research and education activities."

Section 5. Authorizes to be appropriated, from sums otherwise authorized to be appropriated, to the Director for carrying out this Act – $35 million in fiscal year 1992 and $35 million in fiscal year 1993.

V. SUBCOMMITTEE RECOMMENDATION

On March 18, 1992, the amendment in the nature of a substitute to H.R. 2936, was ordered favorably reported, by unanimous voice vote by the Subcommittee on Science.

AS REPORTED BY THE SUBCOMMITTEE ON SCIENCE ON MARCH 18, 1992

AMENDMENT IN THE NATURE OF A SUBSTITUTE TO H.R. 2936

OFFERED BY MR. BOUCHER

Strike all after the enacting clause and insert in lieu thereof the following:

SECTION 1. SHORT TITLE.

This Act may be cited as the "Scientific and Technical Education Act of 1992".

SEC. 2. FINDINGS.

The Congress finds that—

(1) the position of the United States in the world economy faces great challenges from highly trained foreign competition;

(2) the workforce of the United States must be better prepared for the technologically advanced, competitive, global economy;

(3) the improvement of our work force's productivity and our international economic position depend upon the strengthening of our educational efforts in science, mathematics, and technology, especially at the associate-degree level;

(4) shortages of scientifically and technically trained workers in a wide variety of fields will best be addressed by collaboration among the Nation's associate-degree granting colleges and private industry to produce skilled, advanced technicians; and

(5) the Foundation's traditional role in developing model curricula, disseminating instructional materials, enhancing faculty development, and stimulating partnerships between educational institutions and industry, makes an enlarged role for the Foundation in scientific and technical education and training particularly appropriate.

SEC. 3. SCIENTIFIC AND TECHNICAL EDUCATION.

(a) NATIONAL ADVANCED SCIENTIFIC AND TECHNICAL EDUCATION PROGRAM.—(1) The Director shall carry out a program to assist accredited associate-degree-granting colleges, and consortia thereof, to provide education in advanced-technology fields. The program shall place emphasis on the needs of nontraditional students. It shall be designed to strengthen and expand the scientific and technical education and training capabilities of associate-degree-granting colleges through such methods as—

(A) the development of model instructional programs in advanced-technology fields;

(B) the development of faculty and instructors, both full- and part-time, in advanced-technology fields;

(C) the establishment of innovative partnership arrangements among associate-degree-granting colleges, the private sector, and State and local governments (and, where appropriate, Federal laboratories) including programs providing private sector donations, faculty opportunities to have short-term assignments with industry, sharing of program costs, equipment loans, and the cooperative use of laboratories, plants, and other facilities, and provision for relevant state-of-the-art work experience opportunities for students enrolled in such programs;

(D) the purchase or lease of state-of-the-art instrumentation essential to programs designed to prepare and upgrade students in scientific and advanced-technology fields; and

(E) the development and dissemination of instructional materials in support of improving the advanced scientific and technical education and training capabilities of associate-degree-granting colleges, including programs for nonscience students.

(2) In carrying out this subsection, the Director shall—

(A) award grants on a competitive, merit basis to accredited associate-degree-granting colleges that will make contributions, in cash or in kind, toward the cost of programs funded by such grants; and

(B) establish and maintain a readily accessible inventory of programs which are funded under this subsection.

(b) NATIONAL CENTERS OF SCIENTIFIC AND TECHNICAL EDUCATION.—The Director shall establish centers of excellence, not to exceed 10 in number, among associate-degree-granting colleges. Centers shall meet one or both of the following criteria:

(1) Exceptional programs of advanced technical education.

(2) Excellence in undergraduate education in mathematics and science.

The centers shall serve as national and regional clearinghouses and models for the benefit of both colleges and secondary schools, and shall provide seminars and programs to disseminate model curricula and model teaching methods and instructional materials to other associate-degree granting colleges in the geographic region served by the center. Centers designated under this subsection shall be geographically distributed and chosen by a competitive, merit-based application process from among colleges that will make contributions, in cash or in kind, toward the cost of programs funded by grants made under this subsection.

(c) ARTICULATION PARTNERSHIPS.—

(1) PARTNERSHIP GRANTS.—(A) The Director shall make grants to eligible partnerships to assist students pursuing bachelors degrees in mathematics, science, engineering, or technology to make the transition from associate-degree-granting colleges to bachelor-degree-granting institutions, through such means as—

(i) examining curricula to ensure that academic credit earned at the associate-degree-granting college can be transferred to bachelor-degree-granting institutions;

(ii) informing teachers from the associate-degree-granting college on the specific requirements of courses at the bachelor-degree-granting institution; and

(iii) providing summer programs for students from the associate-degree-granting college to encourage such students' subsequent matriculation at bachelor-degree-granting institutions.

(B) Grants made under this paragraph shall be awarded on a competitive, merit basis.

(C) Each eligible partnership receiving a grant under this paragraph shall make contributions, in cash or in kind, toward the cost of programs funded by such grant. The contributions shall include—

(i) counseling students, including non-traditional students, about the requirements and course offerings of the bachelor-degree-granting-institution; and

(ii) conducting workshops at the associate-degree-granting-college, and conducting special tours and orientation sessions at the bachelor-degree-granting-institution to ensure that students are familiar with programs, including laboratories and financial aid programs, at the bachelor-degree-granting-institution.

(2) OUTREACH GRANTS.—The Director shall make grants to associate-degree-granting colleges to strengthen relationships with secondary schools in the community served by the college by improving mathematics and science education and encouraging the interest and aptitude of secondary school students for careers in science and advanced-technology fields. These grants shall be made through a competitive application process from among colleges that will make contributions, in cash or in kind, toward

the cost of programs funded by grants made under this paragraph.

(3) GEOGRAPHIC DISTRIBUTION.—In awarding grants under this subsection, the Director shall ensure an equitable geographic distribution of such grants.

(d) COORDINATION WITH OTHER FEDERAL DEPARTMENTS.—In carrying out this section, the Director shall consult, cooperate, and coordinate, to enhance program effectiveness and to avoid duplication, with the programs and policies of other relevant Federal agencies.

(e) LIMITATION ON FUNDING.—To qualify for a grant under this section, an associate-degree-granting college, or consortium thereof, shall provide assurances adequate to the Director that [redacted] it will not decrease its level of spending of funds from non-Federal sources on advanced scientific and technical education and training programs.

(f) DEFINITIONS.—As used in this section—

(1) the term "bachelor-degree-granting institutions" means accredited colleges, universities, and institutes of technology that award bachelor degrees in mathematics, science, or engineering, or a 4-year technology degree;

(2) the term "advanced-technology" includes advanced technical activities such as the modernization, miniaturization, integration, and computerization of electronic, hydraulic, pneumatic, laser, nuclear, chemical, telecommunication, fiber optic, robotic, and other technological applications to enhance productivity improvements in manufacturing, communication, transportation, commercial, and similar economic and national security activities;

(3) the term "associate-degree-granting college" means a regionally-accredited postsecondary educational institution that has authority to award an associate degree or comparable technical certificate and has the mission of offering comprehensive education services to meet the needs of a prescribed community, including a 2-year junior college, community college, technical institute, or other postsecondary institution offering comprehensive associate-degree programs in technical fields;

(4) the term "eligible partnership" means one or more associate-degree-granting colleges in partnership with one or more bachelor-degree-granting institutions; and

(5) the term "nontraditional students" means students who have been in the workforce and who

desire to further their education and training in advanced-technology fields.

SEC. 4. ADMINISTRATIVE AMENDMENT.

Section 3 of the National Science Foundation Act of 1950 (42 U.S.C. 1863) is amended by adding at the end the following new subsection:

"(g) In carrying out subsection (a)(4), the Foundation is authorized to foster and support the development and use of computer networks which may be used substantially for purposes in addition to research and education in the sciences and engineering, if the additional uses will tend to increase the overall capabilities of the networks to support such research and education activities.".

SEC. 5. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated, from sums otherwise authorized to be appropriated, to the Director for carrying out this Act—

(1) $35,000,000 for fiscal year 1992; and

(2) $35,000,000 for fiscal year 1993.

AMENDMENT I (MR. PACKARD)

Amend the title of the bill to read:

"A bill to establish programs at the National Science Foundation to strengthen and improve the scientific and technical education capabilities of associate-degree granting colleges, and for other purposes."

ISBN 0-16-038389-7

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JUL 03 1992